

# AVIATION WEEK

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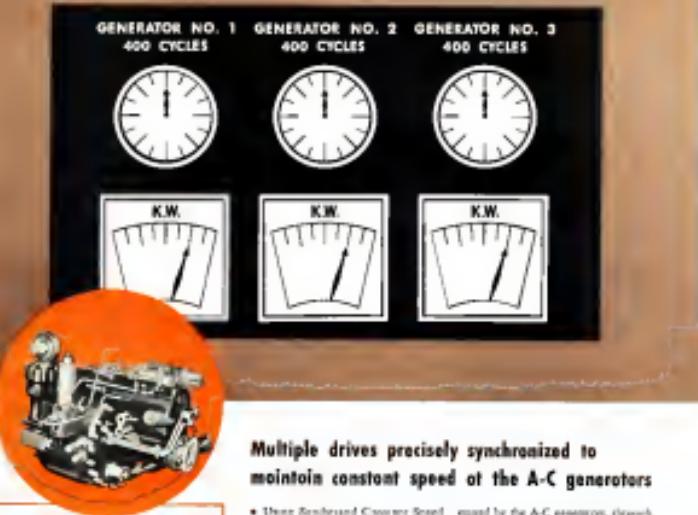
## FRIENDLY ENEMIES

One of the Navy's GRUMMAN GUARDIANS makes a pass over one of the Navy's submarines. It's a case of "friendly enemies" . . . for as the mongoose is trained to kill cobras, these big, carrier-based aircraft are designed to find and destroy submarines. One type of GUARDIAN, equipped with long range radar devices, hunts down the enemy. Then others, lighter on radar but heavier on bombs, come in for the "kill."

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHLEHEM

Contractors to the Armed Forces

**Sundstrand's Constant Speed Drives can be operated in parallel and divide the load**



**Under steady-state conditions:**

**Load is divided equitably  
within  $\pm 2$  KW**

**Frequency maintained  
at 400  $\pm 2$  cps**

**Multiple drives precisely synchronized to  
maintain constant speed of the A-C generators**

Using Sundstrand Constant Speed Drives, any number of A-C generators can be operated in parallel to maintain 400 cycle frequency (within  $\pm 2$  cps under steady-state conditions). Their speeds are synchronized and the load is divided evenly within acceptably close limits—regardless of changes in aircraft operating loads or accelerations and decelerations of the aircraft engine. Maintenance constant power is provided, as re-

quired by the A-C generators, through the input speedometers of these units.

This completely dependable, fully-synchronized system—just proved on several leading types of aircraft—can be designed to meet your aircraft requirements.

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SUNDSTRAND MACHINE TOOL CO.  
HYDRAULIC DIVISION, ROCKFORD, ILL.

AIRCRAFT AND INDUSTRIAL HYDRAULIC TRAINING DEVICES • PUMPS, MOTORS AND PUMPS • AIR SAWING PUMPS • AIR SANDERS  
TATERS • MILLING, DRILLING AND SPECIAL MACHINES • HYDRAULIC TOOLS • HYDRAULIC CYLINDERS

# B.F. Goodrich



## Again—Boeing lands newest ship on B. F. Goodrich wheels, brakes

LANDING GEAR on the B-52 Stratofortress has to bring in safely one of the U.S. Air Force's largest bombers. Boeing does it with eight wheels in a hexapod arrangement. The same B. F. Goodrich 40,000 lb. tire was proved on the B-57 in use. The wheel has tires that load up to 300,000 lb.

The landing gear is also B. F. Goodrich. The Expandable Tidol brake has a new load of 6000 lb. No rivets or welds. The brake lining is cemented onto a light magnesium shoe. The lining wears evenly, giving greater wear life.

full circle of the drum to give greater power to absorb the load better. The narrow-cantilever expanded tubes give more braking pressure with less load.

Landing gear is safer and smoother. Landing gear response is smooth and quickly to minimum pressure, take damage over rough terrain, can't lack power. And they last longer because none of the brake lining is used. Elimination of rivets prevents heat, positive braking down when cockpit门 is checked.

There are other advantages. Wearable shoe dissipates heat more rapidly.

Resilient spring action eliminates wear due to drag. Lining can be handled with a screwdriver and wrench.

Other erosion products come from BFG's research: regressing incandescent, sand rubber, De-Ice, stainless steel rods, Arrow, Permaloy, Super-Steel, Phenolic, aluminum, fast-acting Epoxy, aluminum. The B. F. Goodrich Co., Aeronautical Division, Akron, Ohio.

**B.F. Goodrich**  
FIRST IN RUBBER







## Front Line Express

Chase Assault Transports are designed especially to meet the exacting requirements of the Air Force and Army.

No other planes are capable of delivering vehicles, weapons and troops to forward combat areas by landing — or evacuating casualties from foxholes direct to rear area hospitals.

ARMED — truly the front line express.



## AVIATION CALENDAR

July 14—Regional air safety forum sponsored by Corporation Aircraft Owners Assn. (8th Annual) and CAA, Inc., in "Le Weather Phony", Santa Ana, Calif.

July 16-18—Institute of the Association of Aviation and summer meeting, 118th Western Headquarters Building, Los Angeles.

July 18-21—Women Pilots of America national convention, Chattanooga, Tenn.

July 21-23—National Conference of the Duke College of Aeronautical Technology, Parks Airport, East St. Louis, Ill.

July 26-27—New England Flying Meet, Lawrence Airport, North Andover, Mass. (Run down following weekend).

July 30-31—University Aviation Assn. 19th annual meeting, State Teachers College, Morris, Ind.

Aug. 3-10—Society of Automotive Engineers national West Coast meeting, Fairmont Hotel, San Francisco.

Aug. 15-16—National Flying Circus, convention, Alabama Polytechnic Institute, Auburn, Ala.

Aug. 18-Sept. 1—International Aviation Exposition, sponsored by Area Club of Milwaukee, including Continental Motors Trophy Race, Walker's Point Airport, Milwaukee, Wis.

Sept. 17—Society of British Aircraft Constructors annual display, Farnborough, England.

Sept. 4—Centennial of Engineering banquet, Hotel Knickerbocker, Chicago.

Sept. 6-12—Liaison Society of America annual meeting, management conference and exhibit, Cleveland.

Sept. 14-23—International Fair, Fairchild Airport, Miles, Italy.

Sept. 15-19—International Air Transport Assn., ninth annual general meeting, Geneva, Switzerland.

Sept. 26-27—In-National Electronics Conference, Sherman Hotel, Chicago.

Oct. 1-6—Society of Automotive Engineers national automotive meeting, aircraft engineering, display and aircraft production from the ground up, Los Angeles, Calif.

Oct. 6-10—Aero-sport international aviation conference, Oklahoma University, Norman, Okla.

Oct. 25-Nov. 1—International aviation and travel exposition, Navy Pier, Chicago.

Nov. 1-3—Sportsmen's Show and International Meeting, Society of Automotive Engineers, The Mayo, Tulsa, Okla.

Dec. 2-3—Symposium on light metal honeycomb and extrusions for modern aircraft, Society of Automotive Engineers, Hotel Statler, New York.

Dec. 4-6—National Aviation writers conference jointly sponsored by Biltmore and Douglas Chamber of Commerce, Decatur, Ga.

## PICTURE CREDITS

Top: World War II—Doubleday, Doran & Co.; West Coast—Christian Science Monitor; Paul R. Rosenblatt, Phoenix, Arizona; Edward A. Johnson, Jr., Los Angeles; David A. Johnson, Minneapolis; U.S. Army—U.S. Army Materiel Command; National Bureau of Standards (bottom) White House, D.C.—Lockheed.



"SUPER PROFLY" SUB HUNTER—Pre-production prototype Fairey Gannet attack plane, carries each one of its Armstrong Siddeley Double Mamba takeoff units that down and out propeller. This like model has auxiliary tail fin, with them.

## Foreign Aviation Developments on Trial



SWEEPWING FIGHTER TESTED—Hawker P.1112 (joined) proven to engage swiftest when closed H.S. Eagle during trials to determine maneuvering characteristics of sweepwing planes. P.1112 was fitted with special landing gear for tests.

FRENCH TEST FULMAR—Disassembled glider (bottom) fitted with a tail of Savoia-Kiesswetter 3300 passenger units makes such wing as used in given flight tests. Each weighs 11 lbs., measures 22 ft. 8 in. Length of the pin is 9 ft. 7 in., diameter is 7.35 in.





## Where PRECISION GEARS assure a gentle lift!

The Bell HTL-4 and H-13D Helicopters are primarily used to bring battle wounded out, and do it fast... carrying them in these comfortable, warm, safe litters.

In Korea, the U.N. High Command says, the HTL-4 and H-13D saved 7500 lives in less than ten months!

We make the precise rotor transmissions for the HTL-4 and H-13D that assure a positive, smooth, safe lift as the helicopter flings the wounded off

the ground and saves swiftly to a base hospital.

Precision... in design and production. That is what we have been doing for 37 years. Now 90% of our defense work is on aircraft and ordnance contracts... for one part or a million... and all to the highest precision standards!

All this gives us inward satisfaction... satisfaction because through our products, we are aiding our fellow man, and helping to build our nation's defense.

**THE STEEL PRODUCTS ENGINEERING CO.**

engineers and manufacturers  
Springfield, Ohio

## WHO'S WHERE

### In the Front Office

**Lesney L. Brubaker** has been named a vice president of Bell Helicopter Div., Textron Corp., Fort Worth, Tex. Brubaker joined the company 12 years ago and most recently has been sales manager. He will continue during his six years service.

**Robert H. Charles**, vice president of Bell Aircraft Corp., St. Louis, has been placed in charge of the company's research and development division. In this department, D. F. Munsey has been named manager of customer contracts administration. John Aldridge has been put in charge of a new sales and service division.

**James J. Conroy** has been designated vice president of Miltex Corp., Hinsdale, Ill., a year later, Conroy will make his headquarters in the company's executive offices in New York. He previously was vice president and general manager of the firm's Bellfield Valve division.

**William J. Crary** has been made president and a member of the board of General Laboratory Associates, Inc., New York, N. Y., maker of ignition devices for jet engines. Crary, formerly a vice president of Textron Corp., died July 11, 1951, reigned.

**Robert H. Conroy** has been appointed to our president of the TPA Sales Co., Inc. King formerly was general traffic manager for the motor, which he joined in 1949.

**Ray Watkins**, formerly sales manager and vice president of the firm for Eason, Inc., Chicago, has joined a division of our products. He has made executive vice president of the firm. He will also be in charge of production at Eason's Oglethorpe, Ga., plant. He joined the company in 1941.

**James B. Walker** has been appointed assistant to the president of McNeilus-Holleydale Co., Holleydale, Calif. He came from Pacific Aviation Corp., where he was senior to the president.

### Changes

**Charles Holop** has been appointed to the new position of vice president and material manager of the Bell Aircraft Corp.'s Buffalo Division, Friction division. E. L. Adams has been named general quality control manager for TPA's TPA.

**A. C. Letting** has been named manager of Lockheed Aircraft Corp.'s airtank production department. George Johnson is becoming general manager of Anderson Co., Inc., N. Y.

**Paul E. Conroy** has been designated as software manager for Collins Radio Co., Cedar Rapids, Ia., replacing Alfred K. Higgin, who has retired. His activities for space research. Higgin will act in a consulting capacity.

**Frank A. Lewis** has been appointed sales manager of Allstate Farm division, Kenyon Co., Los Angeles.

**Charles Rugg** has been named assistant director of research division for Marquette Aircraft Co., Vineland, Calif., succeeding P. A. Stinson, resigned.

## INDUSTRY OBSERVER

► Indication that Douglas Aircraft is interested in the proposed 100,000-hp proposed long-range strategic transport plane, which name Art Vincent corps engineer, director of aircraft division, Douglas, N. C., who discussed construction of such a plane. It would have approximately 400 passengers operating speed and would be capable of delivering its load with maximum range of 8000 miles. In the world interested in this type is believed to be evolving out of test cargo runs being made by USAF with the Convair XC-99 six-engine experimental transport (AVIATION WEEK, June 3, p. 10). Convair is much interested in development of a production transport in this category.

► Establishment of a permanent U.S.-British-Canadian technical conference on standardization of engineering standards is expected eventually to pay big dividends in international aviation projects and in many other fields. Agreements on drafting practices have been entered into by the three countries of Canada in future projects such as cross-linking of aircraft and aircraft engine designs. Howard Conroy, TPA director of construction, is presenting the chairman of the conference, which next meets Oct. 14.

► **Mystere IV** is the designation of the new supersonic model of the French Dassault jet fighter. Plans are due to make its first flight in about two months. It is slightly larger than the earlier Mystere planes, though generally similar in configuration. Propulsion is expected to be either a Hispano-Suiza version of the Rolls-Royce Tay engine, or the French Atar built by SNECMA.

► **Boeing** Air division, General Motors Corp., is starting production in Detroit on four and aft fuselage assemblies for the Republic F-105 Thunderchief fighter to be assembled at Kansas City by Clark-Orbital Products assembly division of General Motors.

► Douglas YKD-124D transport, powered with Pratt & Whitney T34 turboprop and Canadair propellers, is making ground runs of its engines. At last report it had about 10 to 11 hr ground time as the powerplant.

► First production prototypes for the Douglas A2D helicopter Navy attack bomber are due to be completed at Aeropadoft's division, General Motor Corp., in late summer.

► Some 1000s are reported building with interest at the Lockheed XC-130 turboprop high-wing cargo plane, now in mockup stage, with a view toward development of a passenger version of the plane.

► The second of Convair's NPS-1 Navy long-range transport plane is in repeated engine testing in San Diego, due to this fall.

► Chevrolet division, General Motors, is raising delivery ton at a time on an order of 172 radial drills manufactured by the French firm of Gaffney, Segot and Pugnat for use in its Tonawanda, N. Y., plant where it is making Wright R3350 aerojet engines. The machine tool order was over \$1 million. Mutual Security Agency has declined.

► Ali Fazal has told Congress the number of initial installations engines on the B-47 bombers ordered under fiscal year 1951 and 1952 appropriations. "That is, it is the as in the original intent," is \$220. This indicates that the number of B-47 bombers ordered under those appropriations is 879. As a result of the new Ali Fazal policy of reducing the number of spare jet engines by reducing pipeline time to 14 days, spare engine requirement for the B-47 has been cut from 15,948 to 8,996.

► Avco-Cessna's CF-100 fighter will not be produced in large quantities this year because of expected changes in aircraft requirements—expected as a result of lessons learned in Korea, which have shown that close development for an untried aircraft program. An Avco-Cessna official says that, having addressed difficulties, RCAF will get one or two squadrons this year, with the job well in hand by 1953.

## Washington Roundup

### Air Power in Politics

Scouring off an unusual political party committee, Congress left behind a sense with these air power highlights:

- Sen. Robert Dole proposed air power into politics with claim that he is in it although he voted against funds to implement a 30-group Air Force in 1979.

- Gen. Dwight Eisenhower took credit for being a key factor in winning the fight for USAF's independence.

- And, Democratic presidential aspirant, Sen. Richard Russell, joined the racing for air power with verbal attacks on the Administration for stretching out the date for achievement of a 145-wing USAF force. Joint Chiefs of Staff's target of mid-1984 to mid-1985. The USAF went along with the Administration's schedule in the 70-group program back in 1970, however.

Yet, despite all of the debating in these air power, none of the candidates for president first that they did short sheet of paper on national air power.

It was on the face of political life that two committees strategized on air power expansion in a successful fight for the \$11.6 billion needed for plane procurement for this year to achieve a 145-wing USAF in two years. They were Sen. Lyndon Johnson, chairman of the Senate Preparedness Committee, and Sen. Joseph O'Mahoney, chairman of the Senate Armed Services Appropriations Subcommittee.

This is in the nation of the \$12.6 billion:

- House Appropriations Committee, in seven sessions, spent of \$500 million.

- As directed by Massachusetts Rep. John Kennedy to increase the procurement fund to \$13.5 billion was deleted down on the floor. It didn't even have enough support for a recorded roll-call vote.

- Senate Appropriations Committee, in seven sessions, passed an additional \$41 million.

- Sen. Johnson and O'Mahoney mustered sufficient support for a roll-call Senate vote to reduce the \$600 million line-item number of the Senate's Senate voted for this, including 19 of the 22 members of the Senate Appropriations Committee, which previously voted an airpower committee measure to cut the House in earlier plane measure.

- House went along with the \$12.6 billion, with some members seconded by members who had attempted to cut the House's bill.

- But the only way to challenge the \$12.6 billion total voted by the Senate was a recorded roll-call vote of the House in favor of reducing the \$500 million cut it originally approved. It didn't happen. Odds are that as a second vote, the House like the Senate would vote for the full \$12.6 billion.

At this time, members don't want to be considered "against" air power.

Next year isn't an election year, however. Congress may be less vindictive on air power and stick by committee.

### Air Force: Loss of Favor

Air Force's term of high favor with Congress ended. There were three factors:

- Administration's Recognition of Air Power—Although the Administration cut USAF's budget from the \$26.7 billion to \$20.7 billion, congressional felt that with the 145-wing program the Administration is, at long last,

doing nicely by air power. There was talk of accusing funds to the local airfield by USAF, but it faded.

- Worldwide Dissemination with USAF Ineffectiveness—More than the other two services, Congress is increasingly critical of USAF on this issue. Examples:

- Criticism of Sen. Wayne Morse, who has consistently voted to give USAF more money. "The most foolish and banal basis of the [airpower] argument."

- Senate Preparedness Committee, preparing USAF to reduce its mixed crew crews, pointed out only 4% of the 1,683 men in a jet fighter wing are pilots to fly the 75 planes.

- Congressmen criticized USAF budgeting as "unwise" and "diluted," and "diluted." In its other budget programs, for example, the cost figure was 2.5, but when USAF couldn't fit all the construction it wanted under the Budget Bureau's ranking of \$1.5 billion, it merely increased its cost figure to 3.5 so the books—even though 3.5 was the actual cost factor.

### Navy: A Gain in Favor

New interest developed by current aviation as an alternative to land-based aviation involving a big money outlay for a worldwide system of bases.

But in Congress thinking air power still tends to be synonymous with the Air Force.

Compared with cuts in other categories, though, Congress cut in Naval aircraft procurement money was conservative: \$100 million off a total of \$3.98 billion in spending.

### CAA: A Sharp Cutback

Civil Aviation Administration was a key target of congressional antagonists. And senators expressed it by cutting CAA's appropriations. It will mean a sharp cutback in CAA's activities:

- House cut CAA's budget for this year to \$144 million.
- Senate slashed it further in \$142 million.
- Then conference concurred on the lower figures in the two versions and CAA came out with a \$141 million budget. That compares with CAA's \$161 million budget for last fiscal year, which ended July 1, and its \$177 million budget for the year before.

### NACA: Cutback, Too

Despite much initial resistance to the importance of research and development, National Advisory Committee for Aeronautics, also will have to reduce its level of operations slightly to keep within the budget approved by Congress.

- The agency has \$43.5 million for operations, compared with \$50.6 million for last year and the \$37.8 million NASA wanted for a stepped-up program to go hand in hand with the buildup of military power.

- And only \$17.7 million of the \$20.7 million NASA requested for new construction this year was approved.

### CAB: Slight Cut

Civil Aeronautics Board budget, after well with the congressional Congress, the \$5.3 billion budget voted the Board for this year is only \$60,000 less than last year's budget.

## Titanium Demand Outpaces Production

### Aircraft industry plans many uses for metal

### So even expanded output will fall short of needs

By Alexander McFarley

Without further to benefit in real increases in apparent major aviation airframe aircraft materials is going on behind the scenes of the U.S. aircraft industry.

It centers on the little-known new "middleweight" aluminum—magnesium, titanium, which now appears set for a much larger role in aircraft structures as well as powerplants within the next five years.

► **Expansion Production**—Testing depends largely on the need with which the present low production capacity of titanium can be expanded to meet early large requirements.

Today an independent Defense Department study finds the capacity of titanium capacity is flat in the fact that department has mostly set up on fast fix requirements for the material for military aircraft.

They call this flat times the available supply in 1973. And with expansion proceeding at the planned rate, the requirements also are going up at a rate which will beat 1973 requirements will four times the planned supply.

► **Aircraft or Tanks?**—How much of the available titanium will go for aircraft is not clearly. Army studies indicate that aircraft and tanks will be the major users. Navy wants it for its new fighter aircraft.

But the remarkable properties of titanium and the ways that are being made with it already are finding many applications in aircraft and engine plants across the country. Consequently, USAF's Production and Resources division, at Air Materiel Command headquarters, Wright-Patterson AFB, Ohio, is spearheading a campaign to broaden its use as aviation.

Brig. Gen. Ken D. Metzger, chief of the division, which handles all major aircraft items, is not at its production and procurement. But he doesn't want it to waste funds and give him a new name with both ends.

► **Heavy Aircraft**—At present he is the somewhat unique position of watching the aircraft industry pick up the titanium bill and run with it in various

### Titanium Characteristics

What is titanium, the new metal so important to aircraft production?

- It is a heavy gray metal, weighing 0.16 lb./in.<sup>3</sup>, 60% heavier than aluminum but only 35% as heavy as steel used.

- It is the only structural metal known to have an endurance limit consistently as much as 30-50% of its tensile strength.

- It is highly ductile metal, described as far as to all the usual expansion methods and strain strength weight ratio.

- It is highly corrosion resistant, having a corrosion-fatigue behavior in salt water practically identical to that of air.

- Its impact strength is superior to aluminum and higher than most alloy steels, some tests indicate.

- It has an extremely high melting point for such a light metal (3,100°), but it tends to low strength and become brittle under continued exposure to temperatures

above 1,000°. Metal fatigue doubt that titanium can withstand stresses above 1,000 deg. can be greatly moderated by future de-creases.

Titanium has a tendency to creep slowly but under stress load, but cold working and alloying greatly improve the characteristics.

Modulus of elasticity is superior to aluminum, but well below other metals.

Fabrication is conventional: powder basic, cast or wrought until suitable cutting is performed.

Forge welding of high strength titanium alloys is not yet satisfactorily, and it is still impossible to weld titanium satisfactorily to other metals.

Source: Titanium Corp. of America.

superior heat resistance and weight savings qualities as the new single-carrying XP-82 interceptor.

► For the same reason of heat resistance, titanium alloy sheet is being seriously considered in a skin material for several of the graded missiles now under development, and at least one is at present being built with a complete coating of titanium alloy sheet to better withstand the high temperatures generated by the engines.

► Lockheed Aircraft Corp. is taking advantage of the high strength and relatively low density of titanium to lighten the configuration of main armament of the Constitution, with an apparent weight saving.

► Boeing Airplane Co. is reported to be using a number of large titanium components, to save weight in the X-33 fighter bomber.

► Northrop Aircraft Inc. has conducted a study of the use of Ti-75TA aircraft metal, cold drawn (at room temperature) and reported that total to a 50% greater ultimate stress value than 24-25 aluminum alloy stress and 50% greater ultimate tensile strength. However, the intermediate stress is lower than the aluminum.

► **Heavy Aircraft**—At present he is the somewhat unique position of watching the aircraft industry pick up the titanium bill and run with it in various

aspects of aircraft design, using titanium as the new single-carrying XP-82 interceptor.

► For the same reason of heat resistance, titanium alloy sheet is being seriously considered in a skin material for several of the graded missiles now under development, and at least one is at present being built with a complete coating of titanium alloy sheet to better withstand the high temperatures generated by the engines.

► McDonnell Douglas Corp. has a Navy contract to produce aircraft gear boxes out of titanium forgings. (Aviation Week, July 7, p. 4).

► Douglas Aircraft Co. plans to make about 30% of the missile skins on the new DC-10 aircraft, using 200 lb. (Aviation Week, June 16, p. 9).

► **Aerospace Englewood**, the place of titanium in jet aircraft engines of the future is also growing in importance. (Aviation Week, June 16, p. 4).

► **Wright-Patterson**, in its investigation of the world's most corrosion-resistant, stable, compressive stress, static, fatigue, and fracture lives, and sheet metal parts.

Alstom is reportedly experimenting

are producing a complete jetby jet component line out of a titanium casting. And other jet engine companies also are looking into it now.

► **Yester's Supply-Two manufacturers are involved with producing commercial titanium in the U.S. today.**

► **Titanium Metals Corp. of Amesbury, partly owned by National Lead Co. and Allegheny Ludlum Steel Corp.**

► **Responsible Arms Co. and Crucible Steel Corp., associated as a joint titanium project at Webster, Fla.**

Titanium Metals Corp., according to a recent report in *ENR*, has completed the first 10 tons of its titanium castings. A day after the *ENR* report, it has a capacity of 2.5 tons a day and is negotiating with Defense Materials Procurement Agency to increase its output to 10 tons a day. Subsidiaries in NPA have announced that the dual-use license has expanded and that other contracts to produce additional titanium be sought "without delay."

► **Bureau of Mines-Walk at the U.S. Bureau of Mines in bringing the Kraft process of reduction of titanium dioxide to a relatively pure titanium sponge is credited with a major role in the commercial development of the metal. Current the Bureau of Mines pilot plant at Bessemer, Ala., is producing titanium in 200-lb batches, and the same process essentially is used by the other manufacturers.**

Titanium Corp. predicts that the current war will stimulate development of titanium Kraft-type reactors in efficient modification of the Kraft process to assure "either doesn't fail again."

Long-range research, however, still is looking for a better way to reduce the chloride-solvent and the salts from which titanium grows in order, perhaps by hydrolysis, following something like the reduction process the aluminum and magnesium.

► **Others in Future-Other manufacturers which are getting into the titanium production titanium program, according to the USAF information.**

- **Kennecott Copper Corp. and New Jersey Zinc Corp., which have a case-based operation in Quebec, have & Titanium Corp. near Quebec, Canada.**
- **R. H. McKinley Co. and Shasta Corp. in San Francisco.**
- **Crown Corp., Chicago.**
- **Global Corp. and Niles-Albion Corp. which have a joint interest in Valley Metal & Titanium Co., Fisher, N. C.**
- **Republic Steel Corp., Canton, O.**
- **Reynolds Metal Corp., Birmingham, Ala.**
- **America Cyanimid Co. (also Chemical division) Freeport, Va.**
- **Benefit Memorial Institute, Columbus, O.**
- **Hornbeam, Inc., Cleveland and Princeton, N. J.**

Indication of growing USAF interest in titanium is a growth material is seen in the recent announcement by AMC of a new Air Force contractor policy on the use of titanium. Issued May 21 by Maj. Gen. Mark E. Bradley, Jr., AMC director of procurement and production, the policy provides that AMC will support:

Manufacturers who are proposing to increase the use of titanium in the production of aircraft and aerospace equipment by allowing them a portion of the increased costs of that material. Due date will be assessed as the contractor has their due date of the estimated procurement with allowances according to those from the use of this material.

► **Work on Policy-Production and Research division and Procurement division at AMC are now working out a formal study which the new policy will be submitted.**

Establishment of this policy followed a survey of the potential availability of titanium. Tests have shown that the material and its alloys can be forged, machined, welded and heated, bent and formed. Early difficulties with grinding operations have been reduced through the use of special grinding techniques. Some problems titanium Corp. reports.

With titanium now being produced in such small quantities, it is preferable for anything but turn which can offer weight reduction corrosion resistance, is best produced. Consumer early price titanium sheet and plate now cost \$15/lb., according to recent quotations from Titanium Metals Corp., while sheet and plate is quoted at \$20/lb., while at \$10/lb. and forgings and bar rolled tons at \$67/lb.

However, the cost of the type of titanium required is at least 7 times \$15/lb., leaving room for optimism that the low cost early production is largely responsible for the current high cost.

## Big AFB Project Dies in Congress

A time political squabbles once again delayed the Air Force's plan to build a major new base in the East for aircraft and supply and as an emergency housing point.

In addition, the award seemed to speed \$2.5 billion in fiscal 1981 for new manufacturing, Senate and House conferees at the last minute included the bill's largest items: \$73.5 million for a new air base at Tuscaloosa, Ala.

Last year, the Air Force tried to get authority to establish the new base at Tuscaloosa, Ala., but it lost.

In conference over the differing provisions of the House and Senate bills to authorize the construction program, the Senate conferees insisted on killing

the Tuscaloosa project. Rather than hold up the entire bill, the House conference agreed: The Air Force is to study again its plans and hoped to try again next session.

## AF Obligates Only

### Third of MSA Funds

Defense Department has been told to explain to Congress discrepancies between projected and actual utilization of funds for aircraft, missile and munitions development and procurement cited in North Atlantic Treaty Organization form through Mutual Security Agency. Estimated obligations had been reported at \$5.1 billion, while actual obligation was only \$3.52 million.

Air Force had programmed \$382.7 million for obligations by June 1. Actual, it was able to obligate only \$208.7 million.

Air Force did obligate \$41 million for Republic F-4PH, \$11.4 million for RF-4PH and \$5 million for F-4PH jet fighters, \$1.6 million for F-4B/C, \$1.2 million for F-4C/D, \$2.5 million for Lockheed T-33 jet trainers, \$2 million for North American F-5E fighters, \$3.8 million for aircraft guns and \$52.3 million as nonclassified arms. An additional \$44.3 million for other than aircraft was obligated as of June 1.

► **Rockwell F-104-C/Unobligated from its programmed estimate were \$36.7 million for aircraft guns, \$1.1 million for Republic F-4PH guns, \$14.4 million for F-4C/D, \$1.9 million parts, and \$3.3 million for Douglas C-47 reconditioning. In addition, planned obligations of \$59 million for C-130 and C-141 models were to remain, as well as \$1.2 billion for aircraft production costs for the A-10, F/A-18, F-16, F/A-18, and another \$1.9 million for nonclassified weapons.**

Non-aviation and aerial obligations as of June 1 of \$21.9 million for aircraft and engines were fulfilled. Navy obligated \$4.4 million for 30 Grumman T-38T cockpit bombers for France and \$4.2 million for 24 TBM bombers for The Netherlands. \$4 million for 88 Cessna T-37U shared by France, \$200,000 for 14 A-37s shared by United Kingdom, \$800,000 for helicopters for France, \$200,000 for A-10 bombers, \$4.5 million for 10 Douglas A-4W fighters for the United Kingdom and \$1.6 million for F/A-18 engines.

► **Army Money—Despite successful obligation of funds for aircraft and related procurement under MSA commitments Navy was unable to obligate at of June 1 some \$3.5 million, primarily for naval craft and other non-airplane items to be procured in France and Italy.**

In conference over the differing provisions of the House and Senate bills to authorize the construction program, the Senate conferees insisted on killing

the Tuscaloosa project.

## Congress Okays Air Power Funds

USAFA gets full \$12.6 billion requested for aircraft-related procurement, although Navy takes small cut.

The "stretched out" U.S. air power program for a \$33 wing Air Force and 36-cutter group Naval Air arm came through as uplink fight in Congress with USAF plane procurement funds intact and Navy's cut a modest \$352 million.

There were the final developments on the defense budget for the 1983 fiscal year, which ended July 1.

► **The full \$12.6 billion requested for USAF aircraft and related procurement to procure for 7,571 aircraft was approved. This will go to \$1.6 billion in aircraft plan financing, \$1.63 billion in aircraft plan financing, \$1.63 billion in aircraft plan financing in 1983 fiscal year. USAF Air procurement offices passed out their requirements at a rate of around \$120 million per month.**

Congress settled on a legislation under which USAF and Navy will be forced from obligating funds needs May and June at a rate exceeding 125% of the average monthly rate between now and then. Likely result will be a more even flow of contracts over the year.

► **The \$10-million cut in funds for Naval aircraft and related procurement brought the total from the \$1.6 billion requested to \$3.9 billion, and more. Navy will have to reduce its planned program for purchasing 7,571 planes this year.**

► **Plans for aircraft and other equipment funding in the air power budget program will continue to increase in the coming year—the \$1.6 billion Air Force and Navy have for aircraft and related procurement categories with the \$10.2 billion the two services were granted for obligating over the past fiscal year. Navy's program will be slightly less, but USAF's substantially greater than last year. USAF was given \$1.6 billion for aircraft and related procurement for the 1983 fiscal year, \$1.6 billion.**

► **New funds for aircraft \$600 million for tank deck aircraft was unobliged. House had banned use of skipfiring funds for the service. But Navy pleaded its No. 1 priority project, added to be allowed to cut back long-lead projects by an estimated \$200 million so it could focus construction of the current to accommodate some of the future and lesser jet aircraft due for production by 1995 to 1998.**

► **Defense aircraft funds were shifted from aircraft to a contribution to services for all the aircraft.**

► **The loss was kept on regular schedule bringing from the service to enter into. Under a previous test just one aircraft a year ago, as a response to the reorganization of Lt. Gen. Edward Quigley and Brig. Gen. Horace Shepard of the Air Force, agency officials now realize before scaling the replacement of \$2 only in case of physical disability incurred in the life of**

deity or by written statement by the Secretary of Defense that the replacement is "in the best interest of the service" or a request to need more of individual availability. Senate fought for a provision permitting silicon to range after 30 years' active service, but lost.

## Bottleneck

► **Lack of jet engines still slows airframe deliveries.**

► **USAFA says problem will be solved in a year.**

Air Force officials last week disclosed that aircraft engine production is 17% behind procurement schedules but that it is expected to catch up within the next year.

Although the shortage is reflected in an overabundance of engine deliveries at several plants, the situation is expected to be eliminated as engine production picks up. The "glut" (as the industry calls the overstocked inventory) continue to be produced to maintain present engine production levels.

Engines currently in production are reported to North American Aviation's Los Angeles Airport plant, where more than 120 engine F-104s were canceled earlier. However, this accumulation is expected to be taken care of by engine deliveries within the current F-104 program, a top USAFA official told *Aerospace Week*.

► **Stiletto-Fischer-General Electric's newest strike at Ladd Field, Ala., at engine assembly plant was reported recently closed but will work with approximately 600 of the workers back on the job. This strike was a major factor in the recent engine slowdown. Stiletto's strike and other slowdowns by shortages of some components, Air Force said.**

General Electric has ample assembly capability, the USAF spokesman pointed out, but is behind on schedules because of the shortage of components Stiletto within the engine industry such as that at Laddfield have also slowed overall schedules, he said.

Generally, it was explained, manufacturers are not able to add aircraft to the F-104 and F-4 aircraft, which are 157 and 162 Wright B-70 aircraft which require assembly in behind schedule. The B-70 program which uses the B-57 Sparrow has been greatly retarded by difficulties in perfecting the Sparrow into production. "The engine problem will be tight," the top official declared, "for the next 12 months, particularly among those requiring deliveries. After that, F-104 engines will be ahead of schedule."

► **Spars Reinforced—Air Force and**



forms back in April, 1951, was sponsored at hot report with a log of about 150 hr in Korea. Availability rate increased 90% up until April of this year when it dropped to 88%.

► **Tire Penalties**—Along with the durability and availability rate, helicopters have other considerable more important factors that must be thought possible. This is the pilot's life, which is loaded off. One has 18 miles, and although the pilot left a heavy shock force, he drew back to have another suffered heavy damage to the nose spar, but the pilot kept it robust in spite of the stark nibbling relatives.

Despite its fine performance in Korea, the HRS-1 is not the first in the development of combat unsupervised helicopters. The Marines were an almost helicopter capable of hauling 23 to 30 combat-equipped troops, or 5,000 to 6,750 lb. Contrary to its classification as a combat unsupervised helicopter, the HRS-1 did not have a combat-equipped soldier plus pilot and copilot, or 300 lb of cargo.

► **Marine Specs**—It seems obvious from here that what is needed is a helicopter designed from the ground up, including engine and design modifications. One of the reasons for the lower than specified performance of the HRS-1 is power. Thus said in Korea are equipped with Pratt & Whitney 1940-37 engines designed for the SNC (AT 50 min). Although the engine is rated at 100 hp, the Marines claim they only have up only 90 hp. With the 300 lb extra, the HRS-1 is expected to have, if at a possible performance would never clearly approach design specifications.

Wheels are considerations, landing gear for combat operations. Pilots prefer self-signing skids for operations in mountains, and from rough dirt fields. Other improvements are required in the shifting design. The pilotes were existing but reportedly are all right now following recent modifications.

Designs are being modified. So far, there has been caught in inspection and corrected by replacement.

Requirements must be built in future combat helicopters.

## Titanium to Be Used In Navy Fighter

THESE are going to figure importantly in the making of North American Aviation's FJ-2 Navy fighter being produced at the company's Columbus, O., plant. For the aircraft-based plane, the aircraft's titanium content, as well as other physical characteristics, is important.

Report is that titanium will be the material for such parts as channel air intake, wings, ailerons and engine shroud on the FJ-2.

## Separation Out

- **Congress fails to act on mail pay, subsidies.**
- **It means new fight over issue in next session.**

Congress left Washington last week without enacting several subsidy-type assistance legislation and there was no project for it would be reactivated before next January.

House Interstate and Foreign Com- munity Committee split on every key issue involved.

► **Blocking Attack**—A majority of the committee voted a bill following the recommendations of Air Transport Assn. Pending a strenuous amendment to the bill, the Senate rejected it.

They were: Republican Reps. John Hartwell and Charles W. Winters, and Democratic Reps. Arthur Bloch, William G. Crenshaw, Louis Fletcher and Mac Masland.

The majority voted legislation opposing the majority bill on many issues to its own post. They followed the recommendations of the Ad-Hoc Committee on the Budget, Post Office Department, Civil Aeronautics Board and all other major postal. The majority would have imposed 12% surcharge on all commercial and agricultural carriers who do not carry mail gratis for schools in the commerce and national defense interest. Ad-Hoc status would similarly extend to mail carriers.

► **Report Unsigned**—The majority report was not signed. It was filed by Rep. Fred Frost.

The majority threatened to bring the fight out into the open on the floor of the House and obtain a second vote on substitution of the legislation they believe is better.

Ad-Hoc Committee refused to close the majority measure for House action, nonetheless at the request of the White House. However, most of the provisions had been approved by the Senate and awaited only House concurrence to become law.

With overwhelming support in Congress for the principle of separation of subsidies from postal rate, this means another knock down-drag out fight next year on specific provisions.

► **Battle Postponed**—But it postpones an uphill battle for subsidy for subsidy from Congress.

However, the highlights of the subsidy aspect:

- Passage of the majority bill requiring that the annual rate for international air cargo be "at least" the Universal Postal Union rate, now pegged at \$2.50 a ton-mile, would mean a "hidden subsidy" of over \$20 million a year, defining the purpose of separation legislation. It would compete with air cargo charges for carriage of first-class passengers of approximately 70 cents a ton-mile and 25 cents a ton-mile for freight. Post Office Department would need to pay about \$30 million a year in compensation and profit to the Universal Postal Union rate if it would under a cost-of-service-plus reasonable profit rate.

- **Yardstick** of "fair and reasonable" set by the majority bill for determining compensation and rates for domestic air cargo is not adequate. It would open the door for "value of service" to be considered as a factor in determining a rate and "a rate based on 'value of service' merely means that it is based on 'what the traffic will bear' . . . This would result in failure to collect the revenue that the Post Office seeks the taxpayer can have."

► **CAB** should not be given authority to enter contracts with the airlines for subsidy payment as provided in the majority bill. "Please Congress should be left undefined in this decision to raise or lower subsidy schedules."

- **Postmaster General** should not be prohibited from changing mail from a regional name, changing a "higher" mail rate to a "truck line" with a lower rate.

- **Minimum of 35 lb** on mail shipments set by the majority bill "would result in substantial payments for fictitious loads in excess of the actual mail load carried."

—K.B.

## Senate Kills Bill on Economic Violations

Legislation giving Civil Aeronautics Board authority to impose civil penalties for economic violations, up to \$1,000 for each offense, was killed in the Senate by Sen. John Spilman.

Spilman's comment: "My reasons are based solely upon a lack of confidence in the Civil Aeronautics Board in dealing with small airline companies . . .

If given the powers contained in the bill CAB could penalties these companies for violations of individual regulations and take action against them, whereas at the past, they have been allowed to do whatever they want to do."

The Board could step in on a particular line and a penalty there, a hundred-dollar fine here and a thousand-dollar there, and then penalties the small lines."

Spilman excepted CAB member

Joseph Adams, who "has suggested opening . . . the division of his obligation to eliminate the small airline and small competition."

# STANDARD EQUIPMENT

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### Private Flying Poor, Says FAI

Private flying all over the world showed a slight decline during 1950 compared with the previous year, and in an international scale there is no apparent sign that there will be any improvement soon, the Federation Aeronautique Internationale reported at its recent meeting.

FAI's 45th conference was held in Madrid and attended by representatives from 25 countries. The Boeing Corp. invited the panel for an international private flying conference to promote travel and permit pilots to operate all types of aircraft in private while visiting various countries.

FAI also called for the halting of the season of insurance coverage required of the private owner, as proposed by the International Civil Aviation Organization last year, relating to damage caused by foreign aircraft to third parties on the ground.

A decision was made to award an FAI diploma each year to persons who have made a noteworthy contribution to private flying. Nominations are solicited from the member states, with responses at the diplomatic mission or by the FAI committee.

### French AF to Get Third of Arms Finds

By Ross Hartline  
(McGraw-Hill World News)

French Defense Minister René Pleven told the National Assembly in Paris he is holding to an allocation of 27 squadrons of 1956 combat planes to be used at the end of year and hopes to increase French air strength to 41 squadrons by the end of 1957.

He and France is spending 30% of the budget allocated to French defense on the air and this year, in addition to the 27 force share of 1956, will add 21% to 1956.

"If we must face an aggression," Pleven said in explanation of the increased spending for air power, "it is in the air that the disproportion between our forces and those of the eventual enemy will be the greatest."

► **20 New Aircraft**—He said an important part of air force finds this year and next will be used to construct 20 fighter and 10 transport aircraft for the French air arm. By the end of this year, France will add 25 new fighter and long range bombers to France, offering the deployment of 1,000 additional aircraft. A plan is being drawn, stretching from the channel to the Swiss border, also will be in operation and thousands of new ground

communications lines for military use will have been laid.

Please said production is being stepped up in French aircraft building industry so that the industry still is operating considerably below capacity because of lack of funds. He said he hoped to be able to increase within a month the placing of a large French order for defense procurement "which will help the French aviation industry to boost its production."

### British Exports Hit \$118 Million

Cost Britain, which has been making history and successful efforts to build up its aircraft export business, went up precipitously. \$118 million worth of planes and parts abroad last year, the largest part being military.

The British feel that airplane exports report sales increase in proportion to the vast new sales with an increase of their workshop and jet transports. But shortage of skilled labor and plane shows, though aircraft equipment is rising. Between mid-1950 and last March, the total exported in military aircraft and parts was \$10,800, a 25% increase. This also is a record showing of jet engine component blades in the market.

Aircraft exports are being strenuously pushed because of the high rate of return compared with other products. A jet transport for example, sells for about \$25 per pound of aircraft equipped with less than \$1.60 per pound for a car.

### Car Ferry Planned For Key West-Cuba

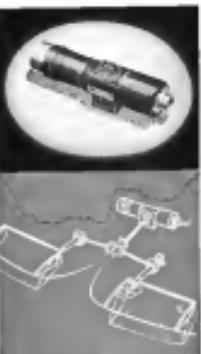
(McGraw-Hill World News)

London—Silver City Airlines, which operates a bus and passenger air ferry across the Channel from England to France (Aviation Week June 2, p. 68), is attempting to transport a similar service to the Western Hemisphere.

The carrier hopes to work out an arrangement with an American carrier to set up a deal between Key West, Fla., and Havana, Cuba. Silver City has been studying that area for two years. It had intended to operate the service on a wet lease, but U.S. authorities rejected the proposal.

Silver City has made large gains in a few years with its aerial line, and the company is interested to be placing orders for those big Black Knights at Lockheed GAL-66. Universal Frightrair, the first Iron Queen Black Knight has arrived for the trip.

### Trim Tab Control System Airborne Actuated



This horizontal stabilizer trim tab control system is a typical application of the R-118 ROTORDRIVE. Electrically actuated with right-angle reduction, it includes 3-way ANGLIGEAR level gear with variable connection links to the servo links.

The R-118 ROTORDRIVE—developed for inter-service duty aircraft servos—is basically a reversible ground motor, magnetically braked, with right-angle power reduction and provisions for monitoring the number of shaft revolutions between different levels for compact design, precise function, right-angle.

Perhaps you have a similar application? See our literature in the U.S. Aerospace Engineering Catalog for complete data on the R-118 ROTORDRIVE.

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## Redesigned Proteus Has Better Economy

- Test runs of model III of Bristol's turboprop engine show better thrust and fuel consumption than estimate.
- And this improved performance is obtained despite reductions in the powerplant's weight and length.

By Russell A. Anderson

The new Bristol Phoenix III (700 mm) turbojet engine is a two-shaft afterburning powerplant. So says the latest test sheet data on the unit, which was recently run for the first time at the Filton, England, works of the Bristol Aeroplane Co. Ltd.

Thus it was shown that the Proton HE test its performance estimates by inflated margins. It evaluated 20% (possibly 25%) depositing in the figure used more than at 6% the estimated ratings. And these results were obtained with a low surface extrusion temperature, an important factor in obtaining the long life expected of a transport aircraft.

Four Proteus engines of an auxiliary power package, the Proteus Benthic Borehole, ten of the engines, are coupled in pairs and the other two single, will be the Saunders-Roe Pegasus later this summer. The 25 production version of the Britannia size of orders from British Overseas Airways Corp will be powered by the Proteus III.   
**P-Designs and Programs**—The first Proteus engine ran in 1947 and the subsequent years have seen it in two versions. The first was the current program in the Pegasus III mentioned above; there are no plans for further development of the engine. That said, that is not well with the Proteus program, because a few months ago when the British aviation press heard—now too widely—that the Proteus was underpowered (The plane weighs about the same as the Boeing Superfortress—around 3,600 lb.—and it should start 1,200 km/h faster, power available for takeoff, so perhaps these comments were well-founded).

Sheldel decided to redesign the engine to reduce the weight power ratio and the fuel consumption. Mechanical and aerodynamic changes were planned to attain these objectives, and the results were told. Tests initially improved the performance of the engine, seemed then reduced the weight and the length of the shaft.

**Bristol's turboprop engine consumption thus estimate. Performance is obtained despite plane's weight and length.**

Right now the test data shows that the Finsen III develops 4,100 kg for sustained use with an additional jet thrust of 933 lb. For this condition, the specific fuel consumption is 0.79 lb per kg. If one is based on liquid oxygen, if equivalent liquid oxygen is used as the fuel, the specific fuel consumption reduces to 0.51 lb per kg,  $\text{sec}^{-1}$ .

**Engines Description** Previous III is a three-flow engine which retains the mass-flow compression of the earlier series, there are twelve stages of feed compression followed by a single stage of catalyst compression. Each stage

Overall length of the new engine is 10.5 m.

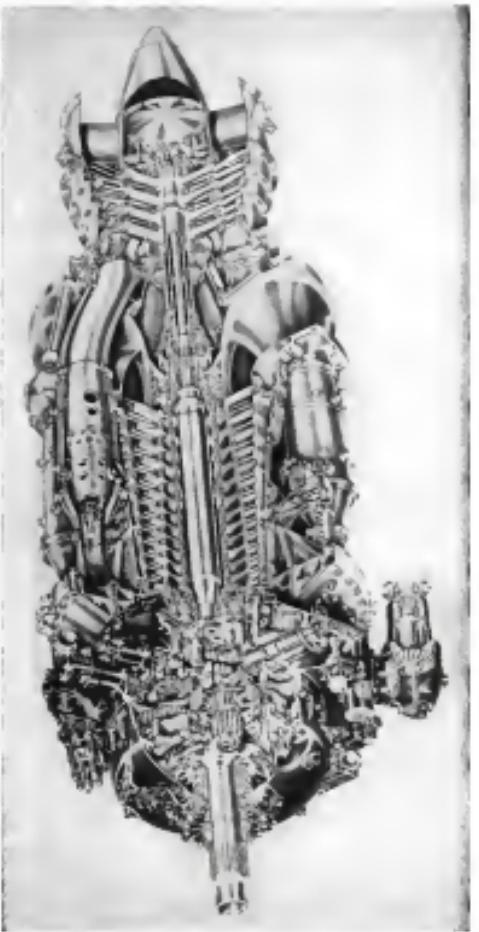
The overall height of the new engine is 100.9 in which is about 13 in shorter than the Pratt & Whitney diameter is also much greater at 19.5 in. By weight, including necessary gear box drive, it is 1,950 lb, on the Pratt & Whitney this figure is 2,800 lb.

The engine responds more rapidly to the command. Propeller speed can be adjusted for optimum power at takeoff and climb and to reduce noise during cruise, without affecting the speed of the compressor.

► **Compact Unit**—The Proteus, in spite of its 13 component stages and four different shapes, is a short engine. Big gain comes for the compactness in the reverse flow design feature. Because of this, Bristol engineers were able to pack the huge unit around the usual engine presenter into a small total diameter.

Reverse flow generally implies considerable mixing of the air between entrance and exit, and this is so for the holes. Between engine air intake and exit exhaust, the change in air is the same through 270 deg. in the plane of the throat line.

THE NEW YORK TIMES



Bristol Proteus Mk. 705 Turboprop Powerplant





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This system of distributing a major part of defense production jobs to subcontractors was pioneered by Pratt & Whitney Aircraft—leading designer and builder of aircraft engines. Ever since its founding in 1925, Pratt & Whitney has pursued its basic policy of letting out about 50% of its work.

Actually 90% of the 2,280 companies on the active Pratt & Whitney subcontractors and suppliers list are classed as "small business" with less than 500 employees each. These companies are located in 34 states.

This system of subcontracting has many advantages. It allows for faster expansion in periods of national emergency and greater flexibility of factory operations. Further, it develops a basic team of specialists that can substantially reduce the cost of certain items of equipment. Also by sharing its work, Pratt & Whitney stim-

ulates industry by providing its subcontractors an opportunity of engaging in diversified production. Finally, subcontracting helps maintain a balanced labor force by providing steady jobs even when civilian production is curbed.

This year Pratt & Whitney will pay out many millions of dollars for the products of its 2,280 subcontractors and suppliers. Some 200 of these Pratt & Whitney subcontractors have served the organization for 36 years or more. Many of them, like Pratt & Whitney, have grown tremendously during the years of working together. As Pratt & Whitney's business increases, so does its subcontractors' business increase, and this is true even in normal times.

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main shaft goes through the hollow case of the compressor turbine shaft. Centering of the turbine shaft is by a snap bearing in the rear end of the prop drive shaft.

A small universal coupling is made the larger turbine coupling between compressor turbine and compressor section. The smaller end connects the propeller turbine and the propeller drive shaft below the latter passes through the compressor rotor. This system of coupling allows independent expansion of the compressor and turbine sections of the engine.

► **Geared-Jet**—a compound epicyclic gear train reduces the 32,000 rpm. of the Proteus III through a ratio of 6.09. Power to the rear propeller four planet wheel, however, is taken through the outer planet which rotates the rest of the planet wheel around the rear shaft axis. Since the planet gear shafts are fixed in bore caps on the flanged base of the propeller shaft, the rotation of the planet wheel axis drives the prop shaft around.

A temperature balanced gear load on the fixed gear and additionally provides a measure of engine performance.

A ball bearing supports the front and a roller bearing supports the rear of the prop shaft and plane-cage assembly.

The reduction gear is fitted with a lock nut which, by shifting of the gear on the shaft, locks on the high speed shaft of the driving system.

► **Accessories**—Of the Proteus III engines, the current type is called the Proteus 705 and it is to this specific engine that the following accessory descriptions apply.

All engine accessories are located around a gear housing which is behind the main induction port. Starter is in the left side and drives the accessories through bevel gears, a dog clutch and spur gears.

The compressor gear, fuel pump, oil delivery pump, scavenger and pressure pump and carburetor are located in the engine frame.

Propeller-shaft accessories get power from a spur gear on the rear of the propeller reduction gear cage which drives a shaft with gear train for the prop control unit. Another shaft drives an accessory gearbox through a set of bevel gears.

The gear-actuating aluminum gear and the reduction gears are also driven from the induction gear ratio.

► **Oil System**—The main oil pump is located below the gear casing. Delivery pressure is 60 psi. From this pump, oil is fed to the metering pump—which supplies a constant quantity of oil to turbine and compressor bearings—and to the torque converter pump, which raises the pressure further before feeding oil to the compressor cylinders.

The main oil pump also supplies 10-psi oil to the reduction gear and

tail rotor shaft gear through the hollow case of the compressor turbine shaft. Centering of the turbine shaft is by a snap bearing in the rear end of the prop drive shaft.



## EX-CELL-O Precision PARTS

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Since the introduction of jet-powered planes, Ex-Cell-O has developed special machine tools for the volume production of compressor parts and fuel system parts and sub-assemblies, including needles.

Ex-Cell-O's aircraft parts production facilities are being used now in cooperation with the defense program. If you are working with this program now, perhaps Ex-Cell-O can help you.

ABOVE: Typical precision aircraft parts manufactured by Ex-Cell-O. All details of construction and materials are determined by Ex-Cell-O to customers' specifications.

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#### THERMOCOUPLE TYPE

All LEWIS thermocouple indicators are fully cold-end compensated, magnetically shielded and are available for use with iron-constantan, copper-constantan or chromel-alumel thermocouples in all standard ranges for the thermocouple aircraft used. A few typical ranges are listed below.

MODEL 118, 25° case in AMR 1045

-50 to +250°C Cylinder Temp.  
100 55561 (A or T18)

-50 to +350°C Bearing Temp.  
8 to +400°C Exhaust Temp.

MODEL 498, 19° case in AMR 10465

-50 to +350°C Cylinder Temp.  
8 to +400°C Exhaust Temp.

MODEL 260, 25° case in AMR 10451

-50 to +350°C Cylinder Temp.  
100 55561-1A or T18

-50 to +350°C Bearing Temp.  
8 to +400°C Exhaust Temp.



#### RESISTANCE TYPE

Accurate, subminiature, these LEWIS indicators are remarkably free of voltage error, have a high resistance (one ohm at the 100° end) and are magnetically shielded. A few typical ranges are given below. Not shown is Model 498, 25° angle.

MODEL 498, 19° case in AMR 10465

-50 to +350°C AM 4708-6 or AM 55565

8 to +400°C OH Temp.  
-50 to +400°C Air Temp.

MODEL 278, 25° case in AMR 10452

-50 to +350°C AM 4708-6 or AM 55565

-50 to +350°F OH Temp.  
-50 to +350°C Air Temp.

MODEL 278, 25° case in AMR 10453

-50 to +350°C AM 4708-6 or AM 55565

through a filter to the propeller pitch control system.

Oil free bearings and reduction gear is retained to task by way of the source pump and an oil cooler. **P-Fuel System**—8. Large variable displacement fuel pump supplies the engine via the fuel manifold. Altitude compensation is handled by the Lewis barometric control.

A conventional throttle unit controls the fuel, thus changes the quantity of fuel in the high pressure supply line to the burner.

Starting the engine uses an electrical motor and pump. The main fuel at high pressure is on the outlet side of the main pump which turns over when the engine is up to speed.

Compressor and air intake cans of light alloy are stressed members, and so built to eliminate the floored compressor and turbine mountings.

The engine is supported from a conventional supporting structure with eight pickup points. The gas supports the engine through two sheet metal cans which are attached to the compressor case.

#### Guided Missile Training School

A pioneer guided missile training course has been established at Northrop Aircraft, Inc. for 90 civilians and military personnel of the U.S. Air Force.

Northrop technicians have mapped a six-month course of study in the theory, design, maintenance and repair of the guided missiles developed by Northrop for the Air Force. A specially prepared facility will handle advanced training class instruction at the company's Hawthorne plant.

Although all details of the course and data on the missile are being held on the grounds of security, there have been rumors reports that Northrop is developing a long-range launched missile missile.

#### Ryan Developing Exhaust Gas Cleaner

Now job at Ryan Aeromotor Co., San Diego, includes development and test of gas combustion considerations of more contaminants from exhaust gas so it can be used for cabin heating, air cooling and other applications.

Company's current contract—already well on its way—requires extensive use being applied to jet engine components which are being used by General Electric Co.

Ryan's development job has created one of a number of exhaust systems for the Pavelet Helicopter Corp. aircraft.

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This 2-ton capacity lift truck has great maneuverability. Equally efficient in crowded places, hangars, terminals or fields. Several heights of lift available. Two (2) models. Pneumatic tires. Overhead guard protection. Excellent operator visibility. Easy to drive—imperceptible.

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In addition to the Hyster 40, the Hyster line includes the Hyster 20, 30, 40, 50, 60, 70, 80, 90, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400, 420, 440, 460, 480, 500, 520, 540, 560, 580, 600, 620, 640, 660, 680, 700, 720, 740, 760, 780, 800, 820, 840, 860, 880, 900, 920, 940, 960, 980, 1000, 1020, 1040, 1060, 1080, 1100, 1120, 1140, 1160, 1180, 1200, 1220, 1240, 1260, 1280, 1300, 1320, 1340, 1360, 1380, 1400, 1420, 1440, 1460, 1480, 1500, 1520, 1540, 1560, 1580, 1600, 1620, 1640, 1660, 1680, 1700, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980, 2000, 2020, 2040, 2060, 2080, 2100, 2120, 2140, 2160, 2180, 2200, 2220, 2240, 2260, 2280, 2300, 2320, 2340, 2360, 2380, 2400, 2420, 2440, 2460, 2480, 2500, 2520, 2540, 2560, 2580, 2600, 2620, 2640, 2660, 2680, 2700, 2720, 2740, 2760, 2780, 2800, 2820, 2840, 2860, 2880, 2900, 2920, 2940, 2960, 2980, 3000, 3020, 3040, 3060, 3080, 3100, 3120, 3140, 3160, 3180, 3200, 3220, 3240, 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## Britain Shows New Plane Parking Device

A new aircraft parking device made in Britain is designed to give high maneuverability under the aircraft or fuselage. The unit, intended to lift the nose or tail wheel off the ground, is made by Loring Baggs, Ltd., Buntingford, Herts, England. Components include a control head, hydraulic lift and remote pilot or adapter ring fitting around the aero lock.

Pilot consists of two semi-circular, light alloy parts which carry brackets to fit the foot or wheel spindle of the particular plane. These parts are removable to fit different wheels. The operator opens the pilot with a quick-release handle, raises it to the correct height, then close it, a sprung loaded catch locking the two halves. Height of pilot from ground allows lifting of wheel with flat top.

Self-lubricated bearings support the pilot and the unit can be turned in any direction without moving the tail or nose wheel, so that it can be locked in fore-and-aft position if necessary.

Lowering and lifting are controlled at the handle with pushbutton.

## Convair Sets Up Executive Training

Company executives will be prepared to fill top general office and executive training division positions, ranging from executives, engineers, and controllers of jobs resulting from expansion, acquisition, and combination of jobs resulting from expansion, under a new plan inaugurated at Convair's Division, Atlanta, Ga.

Convair's approach uses to qualify its own personnel better for the new jobs, boost their current efficiency, and help the company put its hands on the right men whenever the need for it should arise.

First step in the plan is to inventory the executive personnel and review the needs, making studies of age, education, and various levels and formers to fit future vacancies based on retirement, advancement, life expectancy and similar factors.

Second step contemplates an analysis of all current executive positions and setting up spots and standards of performance. After this, executive personnel and their positions will be compared and personnel identified, as general, with "target" jobs or areas of which they are suitable.

Training will include, but will not be confined to, on-the-job coaching, in-plant and inter-plant rotations, in-plant training, company trade, research and correspondence courses.

AIRPORT WEEK, May 14, 1952

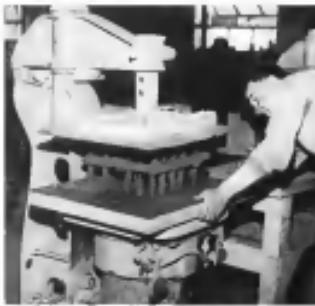
## PRODUCTION



SHREWD VNOIL labor inc housed in enclosed oven-dump box...



VALVES ARE JOINED, held together by adhesive strips...



SPRING-LOADED closing press makes the joint secure, and...



MOLD IS COMPLETE. Metal is passed through gate, right.

## Shell Mold Process Casts Stainless

Large dividends are seen for process still in infancy, but greater interchange of data is necessary.

By Irving Stone

Recent progress with the shell mold process promises cheaper, better and faster production of castings for the aviation industry.

Currently, the procedure is not in

which the molten metal is poured into thin, bladed seedbedding shells instead of the conventional heavy green sand molds.

Details of the process were first outlined in this country in May, 1947, by the Field Information Agency,

Technical, U. S. Department of Commerce, in FIA-87, Final Report 8168, based on data obtained in Germany. But to date little information has been interchanged between founders who have taken up the process. Of some 5,000 founders in the country, only about 100 are said to be using this casting procedure and only a fraction of these on a production basis.

► Applied to stainless—Recently,

AIRPORT WEEK, May 14, 1952



## CHECK

### Shaped Wire<sup>®</sup>

- Flat
- Round
- Odd contour

Low or high carbon, stainless, special alloy, Arctic. You draw the shape—PAGE can draw the wire.



MOLTEN STAINLESS STEEL at 3,100° is poured into successive molds held in such

### Armature Bonding Wire

Drawn stainless or carbon steel.  
In sizes 16 to 100 pounds.  
Bundles have high tensile strength,  
high resistance, low permeability.

### Lock Safety Wire

Strong, durable, wearable.  
In the size and type for your work.

### Spring Wire

Any shape—high carbon—  
hard drawn—high tensile—  
stainless—nickel—  
tinned—bright.

• Cross-sectional area up to  
250<sup>2</sup> square mils to 1/8" in  
width-to-thickness ratio not  
exceeding 1 to 1.



CASTINGS are left to cool. Gases escape through the permeable cast iron mold.

Copper-Alloy Foundry Co., Elizabethtown, N.J., held a press demonstration on the shell molding technique and casting of stainless steel to shell. Copper is a stainless steel foundry, and the personnel of the company were of a scientist's considerable ability that added to the process.

It began research from scratch in August, 1958, and is now in a production basis with stainless and non-ferrous two parts. One of its shell mold cast products is a component for a jet engine afterburner installation. Another job is an engine support fitting, which weighs about 35 lb. per casting and about 75 lb. with bolts and galls. Shell mold for that unit is about 10 in. square, with about 1 in. wall thickness.

• **More To Be Learned**—Copper technicians firmly believe they don't know all the reasons for casting stainless with the shell mold process. But there experiments are continuing, casting on a continuous basis, both on shell molding and casting techniques.

As Copper's field of knowledge is expanded it hopes to promote its ex-



DURING COOLING PROCESS, the shell is gradually loosened away, so removal of the casting is a single motion. The part shown in this photograph is not an engine part—it is a gate valve.

Wire on  
Wire Today

**PAGE  
WIRE**

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**SHELL MOLDS ARE COMPACT** and can be stored indefinitely, under most conditions.

change of automation in the industry, so first deployment of effort will be automated and later perfection of the process and greater benefits can be attained.

► **She-Bs** Made—Cooper's shell making techniques are largely automated. Much metal is made by Macmillan & Mackay Co., College Point, N. Y., and com-

bines an oven and stamp box. Here is the sequence of operations Cooper uses for conventional operations:

First, the pattern plate (each half) is heated to about 50°F. The oven is retracted, the stamp box lowered onto the pattern, and the lever is opened so that the insulation can fall onto the pattern and close it. Patterns and stamp

box are then rolled over as a unit in slow exams and then set by hot block into the stamp box. With levers closed, the unit is rotated back to vertical position. The stamp box is raised, leaving a soft air shell shell on the pattern. The shell is evacuated for about 1 min at 50°F, the oven retracted and the shell precipitated from the pattern, then removed from the machine.

► **She-Bs** Jumbo—Adequate strips are positioned on the flat surface of one metal half, the other cold half is laid over it and the complete unit is placed in a spring-loaded closing press, which joins the two halves securely. A number of these shells are placed in a preheated oven and another stainless steel at 5,000°F is fired into the molds, which sets with a hand held.

The shell mold is possible, you can blow smoke through the shell and get to smoke through the shell from the cold side, the shell is back to normal and given a clean cutting. As the cutting ends on the mold, it practically burns its way through the shell so that accuracy is simple.

► **Rough For Improvement**—There's still plenty of refinement required in the many facets involved. For one thing, patterns costs are high. Because of the heat involved, patterns are made of

## new Cohrlastic heating units



**T**he broad new electric heating pad is the work of Connecticut Head Relyte engineers in cooperation with designers at Consolidated Vultee. It is suggestive of the new ways of applying heat to stamp parts of a plane operating at high efficiencies.

The pad consists of resistance ribbon was automatically and precisely inserted into a thin plastic film with high dielectric strength. Its resistance of 1000 ohms. Thus it is reinforced between thin aluminum sheets that attach to the door assembly. The material is thin and light weight, not over 1000 g/m² in thickness. It removes Relyte and functions at temperatures as low as -100°F and up to +500°F. Normal heat output is 100°F in 4 w/m² per square inch. Elements can be made with settings ranging up to 10 watts per operating on voltages up to 250 volts AC or DC.

Other areas will beinkle heating for aircraft seats, helicopter blades, antenna mounts, oil heat lines, sunlight reflecting receptacles, canopy doors, wire lines, actuators. Elements can be fabricated into a variety of shapes with single or compound waveforms. If you will outline your problem, we will carry on from there.

THE CONNECTICUT HEAD RELYTE CO.  
414 Red Street, New Haven, Conn.

## Cohrlastic

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400 series and 4000 series. Screw frames are chemically treated for positive operating and cycling.



... in 1937

Boeing and Bell in 1937 by the Army Air Corps Experimental Flying Division, the Boeing B-17 Flying Fortress, having undergone the modifications, was one of the first aircraft to be accepted by the Army Air Corps. The aircraft was later used in the development of the B-17 Flying Fortress.

... and in 1952



The F-86 Sabre is the first jet fighter to be built in quantity. It is the result of the efforts of the North American Aviation Company, which has been working on the development of the aircraft for several years.

# PLEXIGLAS

## for transparent enclosures

The success on the Grumman Cougar and the nose of the Stratoplane Engineer open fields for you during which PLEXIGLAS has been used for transparent enclosures on aircraft.

Through the years, PLEXIGLAS has delighted aviation's standard transparent plastic because it provides the best balance of properties for aircraft glazing—shatter, light weight, formability, dimensional stability, and weather-resistance.

Bolin & Bass acrylic plastic has kept pace with

advances in aircraft performance. Many of today's high speed, high altitude planes, for example, are glazed with PLEXIGLAS II UVA (ultra-violet absorbing). This glass has improved resistance to heat, weather and cracking, and is being used by many Air Force and Navy contractors for transparent enclosures on current pressurized aircrafts.

For the planes of the future, Bolin & Bass laboratories are working to raise the quality of transparent plastics to even higher levels.



"Year of Flight" is a new Bolin & Bass film used by the Air Force and the Navy as an official training film on the maintenance of aircraft glass. It is a 30 minute, motion picture in color and sound. Available to aircraft maintenance schools and maintenance departments of the Air Force and Navy. For further information, write to the Public Relations Department, Bolin & Bass Company.

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# BATTLESHIP OF THE SKY



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These Aeropropulsion turbo propellers convert the tremendous horsepower of the two Allison T-40 engines into the thrust which carries this A-bomber to its target.

Aeropropulsion engineers—the same men who developed the propellers for this giant Navy plane—are ready to help you with any propeller problem.



Building for today  
Designing for tomorrow



## Aeropropulsion

AEROPRODUCTS DIVISION • GENERAL MOTORS CORPORATION • DAYTON, OHIO

more a wing is critical alloy, a good percentage of which is normally lost in a casting process.

• Pressing: In shell casting a fixture, too—there is less time involved in moving form mold to mold with the liquid because the shells do not have the bulk of sand molds and can be positioned either together, occupying only about 1/10 the space required by the fixture.

• Casting: In casting aluminum, number one benefit. This means that less metal has to be removed by costly machining operations. Also, small parts usually are cast in series in a single shell mold and cutoff time savings are considerable because of smaller gages, fixtures, reams, fast and controls.

• Better surface finish is obtained, and cold that (natural finish) is maintained because the mold doesn't roll or scratch the shell.

• Cleaned and exact working conditions are another dividend—this is a remarkable advantage and the mold need weight about 1/10 that of the sand mold—easier handling.

• There is a higher productivity with shell molds—they are made extremely stiff at much lower rates than the sand mold can be turned out and in addition can be stored indefinitely until ready for use. This promotes economy in the pouring operation. Making of sand molds must be synchronized with casting of the different dies because the sand tends to dry out—the mold can't be left idle indefinitely.

Additional dividends will be realized as more experience with the process is gained.

## Plane Workers Tops In California

The aircraft industry in California has jumped into first place in the long and explosive history of the state's manufacturing industries, accounting for 25% of the total production labor force.

By May there were 251,000 aircraft workers and related employees according to the state industrial relations office—a new postwar high. Over the past year California's aircraft plants took an average of 50,000 workers over the past two years more than 100,000.

The new total is 51% of the World War II peak established in August, 1943.

## New H-1m Standard Plant

Hawthorne Standard division, United Aircraft Corp., has started production at a new \$75-million Western Tech, Com., plant. The division expects to be in full operation at its new facilities in August following movement from E. Hartford.

AVIATION WEEK, July 14, 1952

## Carter pumps give performance

plus



### North American's F-86-D Sabrejet

is a most formidable interceptor in the hands of Air Force pilots noted for sprung seats, infinite shift, and aggression. The General Electric jet engines put a big power boost through the use of afterburner. The performance and agility of the subsonic fighter hinges on the ability of a tiny 4-pound pump to unashamedly deliver a large volume of fuel under extremely high pressure. A Carter designed pump does this job.



**DOUGLAS A-3D.** Once this plane delves from the belly of its mothership, the interceptors risk of supplying fuel and liquid oxygen to the four engines is a major hazard. It is now relegated to Carter for fire-driven centrifugal pumps.



**AERIAL GAS STATION.** One of the problems of intercontinental flight is to keep the fuel and liquid oxygen to the four engines in the long flight. Carter designed and manufactured gas pumps assure the successful transfer of fuel from the aerial tanks to many of today's aircraft.

## OTHER CARTER ACHIEVEMENTS

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# AVIONICS

## New AF Gyro Gets Avionics Assist

Greatly improved accuracy claimed for Lear artificial horizon; gyros are remotely positioned from indicator.

By Philip Klass

Grand Rapids, Mich.—The pilot's pitch and bank indicators, originally a single motion gyro, later a motor driven gyro, is now a full-bridged attitude device complete with various scales and servos. Lear Inc. is producing the extremely accurate (±3.5°) artificial horizon (AH) for the F-86, F-86A, F-86B, F-86C, and F-86D.

In flight the 5-in diameter horizon indicates horizon as if it contained a gyro, but it doesn't. The gyro element is located in a remote control unit (for better accuracy), and transmits attitude information electrically to the panel indicator.

In return for its increased accuracy and simplicity, the USAF is getting a standard non-tilting horizon gyro.

- Much improved accuracy (within ±1.5° of apparent vertical in level flight)
- Greatly reduced "true error"
- Amplified pitch scale over the horizontal
- Combined low- and spherical-bubble presentation
- Gyro Blanket—Blanket of the system is the vertical gyro which is gimbaled (compensated) for unfiltered gyro data about the roll axis and with special stops set at ±85 deg pitch angle. If the pilot enters beyond 85 deg in pitch, for example a loop, the gyro will stop, causing it to roll on its trailer. It will then roll on the roll axis, which redesigns the gyro to the correct attitude.

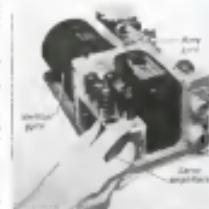
Certain types of陀螺仪 rolling resonance can result in a small attitude error (up to 7 deg) on completion of the maneuver. However, the error is quickly wiped out by the tracking system.

The gyro motor operates at approximately 24,000 rpm. The motor shaft and housing are angular momentum of at least 3,000,000 gm. cm. sec. It is basically the same as the USAF's F-85 autopilot servo gyro. This permits interchangeability and easier maintenance.

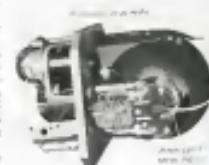
• gyro Error—Normal gyro error is an eccentric system to prevent the gyro from loss from "wobbling." This uses a small eccentric weight attached to the gyro element to cause when the gyro



LEAR 5 servoset horizon indicator for USAF looks and feels as if it contained a vestigial gyro, but it doesn't.



GYRO and servoset completion set in the attitude control unit for better accuracy.



HORISONT INDICATOR made from servos and gyro

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## RESISTOFLEX CORPORATION

Bellville 9, New Jersey

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strike answer to this question. Only flight tests provide a conclusive answer. But what vertical indicators can be used to check a new horizon indicator which is designed to be more accurate than previous vertical references?

This explains why Lear doesn't yet have quantitative answers.

Project engineer L. E. Compton says the new device can more easily be "aligned" than those obtained with previous procedures.

Lear uses a 10°/deg "stagger and drift" rate gyro to sense when the aircraft's rate of turn reaches the 40 deg/sec roll-over/bank rate and to engage the switches early. The gyro is hydraulically sealed and has a small shutoff to provide damping.

Electrical signals proportional to the vertical gyro's pitch and bank angle are generated in two "bentry" type chokes, one for each function.

► Horizon Indicator—The pitch panel indicator, called the Type B-1, uses the same basic design (50° dial from the center) as the horizon indicator. The horizon bar is positioned so as to split and rotated in back by two small 2-phase a.c. servo motors, one for each function. The two servo assemblies which power the motors are located in the same control unit which houses both the vertical and the attitude gyro.

In order to provide greater sensitivity at the pitch indication near the horizontal, the bottom bar is performed through cams to give a more rapid response near the flight attitude. The bottom bar also allows for linear sensitivity near the horizon, that is, that at 90 deg pitch angle, the limit of its movement.

The pitch and bank servo motors drive a black sphere behind the horizon bar in a direction opposite to the bar movement. However, because the sphere has no grad markings below 60 deg pitch angle, the pilot doesn't notice its movement until the horizon bar reaches the 60-deg pitch angle limit of its travel. When the pilot moves his eyes above or below 60 deg in pitch, however, markings on the moving sphere catch his eye and serve as his pitch reference.

A true level on the horizon indicator is said to be "true" if the pitch indication to the pilot's particular level flight attitude. The lamp biases the servo system to deflect the horizon bar and sphere instead of moving the reference bar to cause an conventional horizon indication.

► Servo System—Two identical three-phase a.c. servos are used to position the pitch horizon indicator. Each is built as a planar device and uses a 12A77, 72A77 and 5354 tubes. A 220-WW rectifier and G41 regulator power the amplifiers. Each servo motor

in the indicator devils a small torsion arm generator to provide rate stabilizing signals.

Under steady-state conditions, Lear says the panel indicator will duplicate gyro pitch and bank angles within one degree. Equally important is the system's ability to compensate when the plane is maneuvering. Frequency response is up to 200 deg/sec. Lear says dynamic error won't exceed 1 deg (1 deg/min in static case).

In demonstration mode to the writer, the horizon indicator appeared to be extremely responsive and stable at operation.

► Attitude Indicator—The new Lear system starts up when the a.c. and dc power lines are fed automatically to the vertical gyro at rates up to 175 deg/min. A thermal time-delay relay allows time for the gyro to come up to operating speed. For the gyro to start, the gyro control side is changed automatically to its normal operating value of 16.4 degrees/min and the indicator servo systems are made operative.

► Versatility—The Type B-1 indicator operates with conventional gyro "stays" as well as when the horizon bar and pointer are to the right or to 300° in pitch. However, there are reports that the Resistoflex team might change instruments with "severe" stays which cause observers feel it is more natural indication for new pilots.

If Air Force studies prove that "severe stays" indication is desirable, the B-1 indicator could be easily changed by merely swapping several wires.

The Air Force has not accepted Lear to design the control unit to operate more than one panel indicator. For bombers and transports where dual attitude indicators are required, Lear can be overwhelmed a good deal. That is, one of the two control units would then not divide as panel indicator which could be switched over to the other control unit.



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**Tape Resistor**

**Improved by NBS**

A new version of the inexpensive which National Bureau of Standards developed in 1951 (Aviation Week July 1, 1951, p. 38) has been constructed without expensive tape resistors so that it can be wound onto the circuit.

The NBS resistor consists of a 4-in.-wide aluminum paper tape 1 in. long with a narrow coating on one side and an adhesive coating on the other. The tape resistor was originally designed to be

**Australasia VAR Range**  
(McGraw-Hill World News)

Melbourne—A 30-station, 52-seat television radio stage in getting the first studio from the Australian Govt. Aviation Dept. is due to open, which is expected within six weeks. Teletronics now are concentrating on the master basson system allowing the VAR to be used also for instrument landing.



**Flying Computer Measurements Lab.**

This is one of two C-54s which Standish Research Institute, under military sponsorship, is using to investigate long-range air navigation problems in remote North America developing techniques which per-

mit portions of airplane loadage or equipment to serve as a VHF receiver. Note the black dictation board on the vented starboard floor (arrow) which electrically isolates the two antenna functioning portions of the fa-

prised, can place between two metalized boards in a shielded electronic circuit.

Completeness developed because the tape resistor has to be heat-treated at a temperature of 300°C to bind it in place. Many other components in the circuit could not withstand such high temperatures.

The NBS solution is to make resistor "switches" by passing successively resistive tape against both sides of a metal wire or metal ribbon which provides "on" for the circuit. These units are then given the heat treatment to bind the tape to the lead wire or ribbon. Afterward, the resistor leads may be soldered or spot-welded in the circuit.

The resistance problem is that of heat dissipation of the tape resistor's rated 1-watt at its design temperature of 300°C, when supported on air by its leads. NBS is working out resistor heating curves because of this present shortcoming.



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**Mag Modulator  
For Servo Systems**

A small magnetic modulator designed to convert d.c. signals into 400-cps signals of corresponding amplitude and phase-shift for use in servo systems has been developed by General Magnetics, Inc.

Weighing only 4 oz., the modulator, designated MM-102, operates over a wide temperature range of -40°C to +100°C. The unit is hermetically sealed in MIL-T-277 components, and is to be used in operating life of more than 20,000 hrs.

General Magnetics says that maximum off time due to hysteresis will not exceed 0.8 microsec for a d.c. signal excursion of  $\pm 50$  microamp. Input resistance is 10,000 ohms, output impedance is 10,000 ohms. Output signal voltage is .25 vols for a 40 microamp input signal. Element distortion is less than 10% for signals above 0.5 v, according to the manufacturer of the modulator.

General Magnetics, Inc., 115 Bloomfield Ave., El Segundo, N. J.



**RECORDS TESTS**

Small flexible wire records designed for on-board use to record test pilot's subsonic airspeed reactions as conducted by Wark Electronics Ltd. (Aviation Week, May 21, 1951, p. 45). Recorder weighs 94 lb. and requires only  $\frac{1}{2}$  amp of 25 v. Unit has 60 ms. recording time and frequency response of 100,000 cps.



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(Refer to page 12)

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## WHAT'S NEW

### New Books

*Air Transportation Management—By Practices and Policies*, by Joseph L. Nicholas, 445 pages including index, maps, charts and tables. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., price \$6.50.

The phenomenal growth of the oil line industry, passenger and freight, at the post World War II days has attracted the serious attention of a number of analysts and resulted in a number of massive studies of the development and possibilities of the

As Transportation Management is one of the better analyses that have been published, Authors Nicholas and Jacobsen have left little undone in digging out his material and thus enriched the documentation available concerning the progress of the course. Interestingly, it is the inclusion of several viewpoints in several important areas, which is valuable in allowing the reader to get a rounded-out view of what transpired.

on and methods is also discussed. Not only is there objective reporting, but more sober analysis. The author's close relation with the industry goes back to 1933, and he has worked for a number of big concern. This background has given him a full appreciation of the workings and problems of the rubber industry.

The back will probably have spaces caused by the reverse since the brain and angles are thoroughly coaxed. But brain extrusion area is present and the student will also find much vent holes.

## New Greer Pneumatic Test Stand

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Available in two models, the first incorporates an booster cylinder utilizing shop air and has a maximum operating pressure of 5,000 psi, the other model is equipped with intercooler and aftercooler, a moisture eliminator and dehumidifier with a maximum operating pressure of 10,000 psi. The unit is designed to be used with any aircraft fuel and is completely self-contained. The unit is built to the highest quality standards and is guaranteed to provide reliable service for many years.

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#### Publications Received

**Management Controls in Industrial Research**  
Organizations, by Robert N. Anthony, stated by John S. Day, published by Graduate School of Business Administration, Harvard University, Boston, Mass., 1952, 86 pp. A study of management control practices in industrial research organizations.

HandBook of Supreme Aerodromes,  
Vol. 4, a Bureau of Ordnance Publication,  
for use by the Representatives of Delega-  
tions, U. S. Government Printing Office,  
Washington, D. C., 1912, 30 p.

- *Dr. Post-The Autobiography of an American Entomologist*, distributed by Charles Scribner's Sons, New York, 1912. Published in connection with the Peabody 25th anniversary on July 15, postscript added later.

## working on Aircraft Contracts?



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## EQUIPMENT

# Tactical Jets Prove Ruggedness in Battle

- The book is tossed away to keep them flying.
- F-80, F-84 equipment takes heavy pounding.

By George L. Gherman

**F**ighter-bomber B-52, FEAF, Korea—The book is tossed away to keep them flying. The book plus full wingtip tanks and maximum ammunition, bring the sturdy fighter's weight over 19,000 lb—more than 3,000 lb above the ship's rated maximum take-off limit. Despite the overload, compensated by shortening of fuel tanks, dropping munitions and rougher airdrops, a negligible percentage of planes show a tremor and a large number come back.

At a nearby base, Bataan-based F-84s are also bearing huge loads of destruction to the enemy. This reporter watched plane after plane with 1,000-lb bombs, plus rockets, plus downed survivors and number two in the air to the distinctive pop and hiss of nose Roto bottles. This particular day was calm with no wind to blow over the white Roto clouds hanging over the end of the runway. So the first step is take off load these bottles to the last second to keep the plane as far down the runway as possible.

Each succeeding pilot discharged his just a little ahead of his predecessor. As the cloud gradually covers further and farther back down the strip, the last F-84 is burrowing through the dense fog at a 150 mph clip, taking all load. Every plane returned and the only damage was a dented leading edge where a rocket had passed, and some scratches to the skin.

► **Overload.** Toho-Dorseyt fighters are taking their toll of both F-80s and F-84s. On the 94s, the wing damage rate is high because of the excessive loads imposed on the structure by the combination of heavy loads and rough terrain.

A somewhat different problem exists at the F-80 base. To keep loading gear stuck open from bottoming during taxi and takeoff when the aircraft is fully loaded with 2,000 lb of bombs and full tanks, the crew have to be pummeled up. When the gear returns from its mission within the bounds and with threads dry the plane is relatively light. When the gear is set down



NAPALM TANK hits every benthic left wing of F-80 coming in to attack supply building and vehicles. After-attack fix is indicated by that white tail ending in twisted mesh resulting in F-80's right wing from gas pressure at load of 1000 lb.

on the runway the shock starts, in flight for the heavy loads, in taxi and preparing, impose severe loads on the strut, attachment fittings and wing.

► **Rocket.** The Squadron Maintenance all-nose gear strut even 180 lb and 50% are rejected. Rejection rate of the main

gear wing attachment fitting was quoted at 75%.

► **Gas.** **Location.** Another result of loading heavy loads on the wing is that, when righting down the leading edge, a perceptible drop appears outboard of the leading gear.

Only after difficultly the wing's engineering officer put out his tale of woe when trying to keep a full squadron of jet fighters in the air with little more than 50% of the normal complement of maintenance personnel. He had to cut, in old time, weather-beaten names agains painted into the office, his loads three deep in his covered pocket—“he” he said, “we have not been assigned seven planes.”

► **Thunderbolt Activity.** The long-legged F-86s operate from fields tucked farther behind the lines than their F-80 brothers. And, although a new runway is rapidly approaching completion, the 86s today are restricted by ground plank strips on each takeoff and landing.

As a group, F-84s pitch in probably



F-84 TIP TANK was well loaded by large shell which apparently exploded inside.



LEADING EDGE of worker F-84 was blown away by direct hit, but plane remained.



F-84 badly damaged without hit effect.



This job is done from the afterburners of the U.S. Air Force Northrop B-57 Canberra. A specialized division of the company has built an airframe for jet-powered Northrop aircraft used on the B-57. The aircraft became over 1000 pounds lighter and was easily maneuverable, as well as highly maneuverable. It is ideal for defense of our fleet and a major contribution of approximately 100% to its success! This was made very difficult by the use of insulation materials. Insulation was quickly applied in all aircraft sections.



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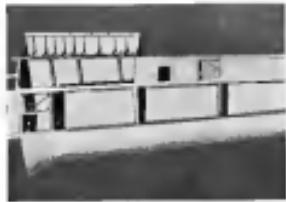
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Problems of unusual weight, increased unusual rigidity, and simplified design can often be solved by using magnesium.

In the design of high-speed wings, for instance, the use of a skin that is made possible with magnesium offers many advantages. A magnesium skin is a lighter, thinner, plainer, and more economical. Note the simplified construction. Although this wing, ready for flight, weighs no more than a conventional wing, increased rigidity has been increased 50% by using a thin magnesium skin, all rivets were removed and half the ribs were eliminated, reducing the number of parts 60%, the number of fasteners 80%, and adding fuel capacity that increased the plane's range 15%.

Whatever the combination of strength and light weight are a design necessity, look at magnesium. Recent technical advances in alloying, fabricating and finishing have made magnesium a leading metal for aircraft construction.

THE DOW CHEMICAL COMPANY

Magnesium Department • Midland, Michigan

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ing the 1,000-hp mark, all the planes respond to increased wing loadings with an opposite, not an opposite, rate of efficiency.

► Around the Lake—Ground crews like the amateur drivers of the Transdome jet. Simple economy says that if it worked well, it was easily memorable and easily maintained. They added fast, relatively spacing component accessibility was one of the good features of the design. The engine was rugged, too. You can, too, with the F-86 fuel cell to put at that place, and Americans are holding up well, according to the men on the line.

► Topdeck—Transdome jets are also having their share of technical trouble, but of a different sort than other jets. Metal fatigue specialists explained that some transonic loads have been which are several degrees off design. Other problems were structural difficulties and loads.

And canopy seals give the crews quite a struggle. Subsequent to extensive of design, the problem still requires modification at 30-35°, a condition which puts quite a load on an already overworked engine, where wind tunnel drag starts at 5° and much at 9°, never, never does a week.

Greys' engine historians are going out of consciousness in spite of strict measures which have strenuously been included. Engineers claim that the rough and tumble treatment they are given is damaging for the intricate engine mechanism.

As at most jet squadrons bases, pilots and maintenance personnel that are particularly fond of the "scorched jet" the B-57 and related versions are.

► The E-10—One of the most expandable components on a jet fighter, one each one opening of pivoted plate strips, are the tanks. If a jet misses 12-15 landings it is doing well. One strike that give 2-3 landing less than accurate was considered catastrophic.

The Grumman tanks are holding up very well and giving excellent service in spite of heat shear, bending the 150 mph landing of the jet on relatively short runways. The tanks can take little overtake, though, if they are repeated.

► High Morale—At this time, at the other far corresponding variant, much of the mass base construction intended to break ground was at an undeniably high level. The pilots went to combat with the warhead at a corner and the ground trembled long hours to have the plane in top flying condition. As such high removal, you could see them lined up at the revetments, most not their plane's name. And they are greatly improved. One squadrons had only 62% of normal complement of maintenance personnel.

As we left the base in a tailwheel Transair C-47, one of whose emergency exits blew open during flight but did

not even cause a slight stir among the crew, we carried over the truckload, impression that the boys in khaki are doing and believe good job by substituting imagination for laziness and ground long work for sick leave.

## Fuel Tank Nut Sealer Gains Favor

Greys' Gold-in-a-new method of sealing magnesium wing tank nut, bolt and flange nuts is rapidly gaining favor in aviation circles.

Called Seal Caps, the device is being used by the thousands on B-56 aircraft.

1925 Then as Now 1952

## EDO leads in Seaplane Float Design and Manufacture

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Reproduction of an early Edo ad which appeared in the May, 1927 issue of AVIATION magazine.

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out of PB-61) is applied over entire coil and insulator base.

Accumulation claimed for the device by the maker are:

- Task tightness is increased. Use of Seal Caps eliminates or reduces which are difficult to avoid when using the bush and gasket type of sealant application. Uniformity of results may be expected because of the simple and direct method of sealing.

- Inaccessible areas are given the same treatment as easy-to-reach locations. There is no longer any question of achieving uniform performance of the sealant application to reach all surfaces to be sealed.

- Money is saved because of ease and speed of application. Seal Caps save money on original installations as well as on rescaling jobs.

- Weight is reduced, especially in large tank applications, because less sealant is required to cover the many tiny areas of leakage found in modern fuel tanks. Greater payloads and increased operating economy will result, according to the manufacturer. And, because of lighter loads, overhead provides an automated and maintenance costs reduced.

• Scaling time is cut. Use of Seal Caps

is more rapid than bush and gasket methods. And being easier, it does not require so much know-how of the worker, therefore less skilled labor may be used.

Product Research is known to many

U. S. and foreign names as the manufacturer of integral fuel tank sealants and 60 and 80 drum solutions. The company is located at 5405 Sea Forestwood Road, Chicago, Calif.



#### Senses Fuel Flow

A new photoelectric sensing system for detecting presence or absence of liquid in a bore, tube or pipe has been developed by Wm. R. Whitelaw Co., Ltd. Developed primarily for aircraft use, the "magic eye" device can be adapted for any application where instantaneous signaling of change of flow in a line is desirable.

The system consists of an obstruction in the line and an air moving past. The moving air, which serves as a part of the line, has a reducing cylindrical piece

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## CHAMPIONS



"No other spark plug performs like Champion in our DC-2 and Twin Beech. The DC-2 is equipped with type R-1575-1 and the Beechcraft with the R-1575. These are the most popular plugs we have ever used, saving only cents between purchases. Their real performance!"

WILLIAM A. MERVIN, Chief Pilot  
OWENS-ILLINOIS GLASS CO.



"We've eliminated spark plug trouble since we've been using Champion. The type R-1575-1 has given excellent service in our DC-2 and Beechcraft." G. A. Anderson, Chief Pilot, OWENS-CORNING FIBERGLAS CORP.



"Competitive performance and economy has pointed the way to the Champion R-1575 for our DC-2 and the R-1575-S for the Twin Beech. You can depend on Champion Spark Plugs—all the way!"

TRACY SERVICE, Chief Pilot  
LIBBEY-OWENS-FORD GLASS CO.



CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO





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hours per  
replacement  
get  
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the  
preferred  
wiring  
of the  
aviation  
industry

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Akron, Ohio

between prevailing market quotations and current investment values and earnings. Market valuations at any given time, represent a proportionate discounting future prospects. As these prospects grow, in closer perspective, market valuations are quick to adjust accordingly.

Product experience fully demonstrates the positive future of life on the aircraft industry to give the valuations and indications. Certainly, the enterprise is in a much more established and stronger position today than it was 15 months ago. However, the market value of its equity is less.

► **Mark Bulk Reserves:** The company is considered one of the major helicopter builders in the country and is well established with more advanced and larger models in mind production and with other developments constantly going forward. Considerable risk has now been removed from the aircraft plant and some initial uncoordinated relationships are beginning to emerge for its rights.

Other lines are emerging in the helicopter field and are demonstrating that ability not only to survive but to become a permanent part of the industry. One such company is Division Helicopters, Inc., Duxbury, Conn. During the great speculative boom in helicopter shares were two years ago, the ownership stock of that company was traded in the over the counter market at around \$4.30 per share. The company has submitted an order from the Army Field Forces for an 112-5 helicopter and has for some substance in its corporate structure more than it did in the past. Yet, earlier this year, when a limited number of additional common stock was made, the offering was at \$3.75 per share. Current quotations are around \$3.00 per share.

As with all enterprises, once their position become established, the investment term remains in the industry to stabilize a fair valuation of value and the earnings that will develop as a result. The helicopter companies will follow the same pattern.

—Selig Alford



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## AIR TRANSPORT

## Pilots, ATA Favor Centerline Lighting

- Two groups are unanimous in urging CAA to go ahead, but Air Force and Navy plug for their own plans.
- CAA officials still remain indecisive after five years of extensive study of airport approach systems.

Another in a five-year series of formal and informal evaluations of airport approach lighting has been submitted to CAA Administrator Charles Flora. This one shows tremendous oval point support of the centerline system after extensive flight tests, as was expected. Also as was expected, Navy and Air Force dissent—each plugging for some device.

CAA had hoped this evolution, one faction at Home's request, would at last create a studied option in time for the International Civil Aviation Organization conference at Montreal starting Oct. 21. All sixteen nations except the U.S. were ready to stand aside on contentious at last year's ICAO conference.

Both the Air Line Pilots Assn. and the Air Transport Assn. are getting

the new standard and the growing heavy pressure on CAA now to go ahead and come out for a centerline standard. But CAA's officials, from Administrator Hines and Deputy Ad-

minister Fred Lee on down to the park and the, are all indecent.

**Navigation Systems**—This indecent, coupled with GAO lots of military option, may mean the most recent of saying type installations—even though most experts agree that about are broken at a single standard a better than existing five more years for something slightly better.

Most CAA installations are in the form of a 5th-wheel row of bays leading in to the side of the runway. CAA has also installed straight-line or various supports that is a V-shaped pattern leading into the runway side. And CAA installed a continuous system at about 1000' distance for maintenance at New York Airport. The British have long settled on the Calvert system of orientation. And the French had an odd half-bay row and bay system but have now adopted continuous.

In the new CAA-sponsored resolution by a five-man committee the CAA representative, Art Jenkins, wrote the report forcing acceptance, and it was consumed to by the ALPA's Ernest Cottrell and the AFA's John Goff. □

numbers write declining letters, close

position from approach to feeding. This is a strength and advantage of the present study.

► Report to Unofficial—The new CAA officials who have seen the new legislation say that the agency is not yet prepared to implement it.

canine we have had, and the report we've received is that the opposition—not quick to point out that about all the reports are no official source, it's just the accumulation of them—have, although it's been held for a full half of the U.S. Congress and

See the new evaluation report we adopted to Hause generally revisits what happened, but leaves for two years or

These natural safety pilot and other civilian operations should reasonably serve the civilian system. New pilot and engineer training for the pipeline, *“anti-sabotage”* doctrine prohibits such, until reliable excesses in reflect and control systems are developed.

**Final Public Report:** This paper is a summary of an operational civilian pilot evaluation of aerial landing approaches made on each of the different systems during bad weather.

Their reports are titled as the basic

Asked if CNA will ever decide to go ahead on its own, rather than wait for the other three, CNA's Vice President of Strategic Initiatives, *John*

- Identification of the space from  
distant distance from other lights entered  
the place.
- Alignments with the runway direction  
recognition are also used.

## Airline Accidents in 1951

\* Interpreted and stratigraphic surface  $\alpha$ -fission radionuclide measurements for total sediment thickness of 115 m. Whole total sediment by type modifier is 115, two types figured in this column. Estimated values based on  $\alpha$ -fission radionuclide data.

— 10 —

growing. Midway planes made 17% of the approach approaches to and landings the seven months ended last January, about all of those midyear approaches were by ground control control, whereas about 15% of all approaches were by ILS. The last 10 months the situation has been reversed, with the figures being 10% and 25% respectively.

Midway planes made only 25% of the ILS approaches as high-intensity lighted fields during the same period. ▶ **ATAKES** From CAA—In a three-letter to the Board, ATA's engineering and operations vice president William Arnold writes: "The following statement sums up the ATA position:

"The U. S. should adopt a nationalized en route approach lighting system having a basic configuration closely approximating that of the controller system tested at Newark, N. J. The standard should permit the installation of approach lighting lights (supplemented on the basic system to avoid confusion with instrument lighting).

"The U. S. should permit for an international standard approach lighting system composed of a basic controller configuration supplemented by a transmitter or bar. The scope of the standard should be such that both

the British Colgate system and the controller system at Newark meet the requirements of the standard."

He adds: "We feel strongly . . . that any known system . . . which meets the necessary requirements for overseas use is acceptable. The Colgate system, which is close to the approach lighting system now in use, but which high-intensity approach lights are designed. We therefore feel that it may be necessary to change the extension system concept, under which approach lights are concealed in order to specify a system which will meet present and future en route lighting requirements." And he adds that the Colgate system favored by Navs and by some CAA managers has proved too costly in actual operation.

It adds as of CAA, assume an international en route extension system to the benefit of the pilots and operators it was set up to serve, but to the detriment of en route. Deputy Administrator Lee uses this a "plow of snow" below the ICAO meeting, but said that CAA was not decide even then.

However, ATA and ALPA are going to make an effort to end CAA's indecision this summer.

## World Air Route Changes Loom

Far East certificate renewal and Atlantic airfreight cases may result in some radical alterations.

Actions of CAB and the President in the trans-Atlantic airfreight and route renewal cases open up two major cases that may change world air routes and operations radically.

For Far East certificate applications of TWA and Pan American for India to Japan routes are consolidated with Northwest's application for similar routes, the Board may also consider the Northwest and Pan Am Pacific routes now in use at the same time. These routes converge with the world-wide links through Southeast Asia and India to the U. S. Pacific Coast may be wiped up into one great new one.

Atlantic cargo certificate application of Pan American, Transoceanic and European American for U. S. Europe airfreight routes are proposed.

▶ **New Airline Case**—Only a month ago, the Board majority thought the overseas airfreight case was finalized, with all three applicants denied.

Then a board panel in the Board Defense Department had specifically asked CAB to re-examine an off-certificate application (AVIATION WEEK, June 16, '59).

And so board, Transoceanic and EAA all noted that over the original case had started. TWA and Pan American had abandoned a large share of the

British Colgate system and the controller system at Newark met the requirements of the standard."

The case is apparently simple, not only because of its many long routes with comparative airline applications, but because of the unusual, non-technical problem of getting two major routes, as a result of the general cold war, plus two hot wars in the area.

Alaska defense construction business is booming once, but the question will arise at review time next year whether Alaska service can support all five of the present scheduled carriers—Alaska Airlines, Pacific Northwest, Northwest Airlines and Pan American.

Hong Kong and Shanghai, major port of China, are new ones.

Japan, Indo-China, Formosa and Korea are showing up because of their port services, one of proportion with some transoceanic dimensions.

The Board will operation grant new routes and supporting old ones.

"It will be a great one," Shultz concludes.

For hearing conference may be scheduled for the fall. One general pattern of CAB thinking may be to follow Pan American's present "round the world service" by joining TWA and Northwest at appropriate points in the Far East to form another "round-the-world" route, some observers predict.

The two scheduled cargo go over great distances could but conceivably at certain points, such as Tokyo

## Liaison Conference Scheduled for Rome

(McGraw-Hill World News)

Rome—An attempt will be made to reduce liability, responsibility for en route operation at a special international conference of pilots and experts representing the International Civil Aviation Organization and United Nations to be held in Rome Sept. 9.

The proposed airfreight case was ultimately sent a while new fleet of two of specialized cargo planes holding the world's air cargo on regular schedules across the U. S., Europe, Middle East and perhaps other areas.

World's biggest Route-Safety Board aviation director chief Bernard Sabot says the coming India-Pan-East Asia route renewal and reevaluation case is the biggest remaining international route problem at all. If the biggest is one and the most pressing and difficult is another.

It is here to make changes—Seattle-Alaska, West Coast-Ocean, Over Southeast Asia, and Southeast Asia-India. It may also involve Pan American. Pan would be considerably lower than those currently being charged by scheduled services.

## Safety Group Cites 43 Sked Airlines

The National Safety Council has named 43 airlines winners of its 1951 passenger safety award. Only eight sked CAB-qualified U. S. passenger operations are counted under the rubric of the award.

There are three ways as airline participants in the award:

- All of 1951 without a fatality.
- Fly 2 million passenger miles without a fatality.
- Fly 5 million to 1951 without a fatality.

The Safety Council doesn't try to reward in proportion with degree of safety in these categories.

But the grand finale that American Airlines had the outstanding safety record through the end of 1951. American had flown more than 41 billion safe passenger miles since November, 1949. Also, for through-1951 record of Eastern with some 3 billion and TWA with more than 24 billion are outstanding on that basis.

Lauding at safety records that were not off within the year 1951, United shows up with a record of more than 4 billion safe miles.

Then there were 31 smaller airlines that had no fatalities (under 100 miles of the award) since their founding.

Here are the awards (with period of safe operations and total miles) under the passenger routes:

- **American** American Airlines 11-24-50 to 12-31-51. Total Miles 1,081,451,884. Total Pass. 1,025,001 to 1,030,000. Certified American.
- **Continental** Continental Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Continental.
- **Delta** Delta Air Lines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Delta.
- **Eastern** Eastern Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Eastern.
- **Frontier** Frontier Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Frontier.
- **Midwest** Midwest Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Midwest.
- **Pan American** Pan American 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Pan American.
- **Trans World** Trans World Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Trans World.

• **Standard** Standard Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Standard.

• **United** United Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified United.

• **World** World Airways 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified World.

• **Yukon** Yukon Airways 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Yukon.

• **Other** Other Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Certified Other.

• **Non-Certified** Non-Certified Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Non-Certified Non-Certified.

• **Non-Commercial** Non-Commercial Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Non-Commercial Non-Commercial.

• **Non-Scheduled** Non-Scheduled Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Non-Scheduled Non-Scheduled.

• **Non-International** Non-International Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Non-International Non-International.

• **Non-Commercial International** Non-Commercial International Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Non-Commercial International Non-Commercial International.

• **Non-Scheduled International** Non-Scheduled International Airlines 1-1-51 to 12-31-51. Total Miles 1,070,000. Total Pass. 1,025,001 to 1,030,000. Non-Scheduled International Non-Scheduled International.

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24-25 P.A. 100,100,000. Pilgrim Air Lines, 8-9-10, 22-23, 24-25, 1981 (PA 22,380). Pan American, 10-11, 12-13, 14-15, 16-17, 18-19, 20-21, 22-23, 24-25, 1981 (PA 22,380). Trans-Tropic Airlines, 10-11, 20-21, 22-23, 1981 (PA 22,380). West Coast Airlines, 7-8-9, 12-13, 16-17, 1981 (PA 22,380). Western Airlines, 4-5, 10-11, 12-13, 1981 (PA 22,380). ▶ **Trans Air**  
January AIRPORTS, 4-6-10 to 12-15-1981, R-112.

■ **No airline** continues from page 100, Part 1.

## Seven-Year Renewal Granted Robinson

The Civil Aeronautics Board has awarded Sabena Castings certificate for seven years to June 30, 1988. Sabena is a local line serving New York State.

The Board denied Robinson's application for new routes to Lake Placid and Poughkeepsie because they already are served by Colgan Airlines. But the Board added Whiteface to the Robinson route.

CAA's order complies with Sabena's as its proposal to convert its debt/equity ratio to equity capital. According to the Board:

"Transportation as a whole, and air transportation in particular, is subject to sharp fluctuations during the recession phase of the business cycle ... rates are substantially increased when the carrier is already strained with equity securities. For equity capital, with its freedom from fixed charge, will act as a cushion against economic adversity. Moreover, the airline industry ... is faced with a relatively small potential capital investment requirement, which is consistent with its funding needs."

The largest share of its capital is invested in assets having a high rate of technological obsolescence. These characteristics contribute to the lower debt/equity ratio of reliance on debt as compared with common stock financing, for both fixed capital and working capital requirements."

## Sabena Sees Plane Buying Problems

Sabena Belgian Airlines president Gilbert Peeters reports that although Belgian traffic will probably continue increasing at 10% annually, two big push factors for his and other airlines:

- Big jet, turboprop and piston powered planes wear.
- Where will aircraft lead the break away?

On the "peregrine shower" between jet, turboprop and piston power, he says "Indeed, such aircraft spent in considering the matter means two or three months wasted as far as delivery dates are concerned."

As to the break away "experiment" he

says "We are aware of going all-out for experimental high-density aircraft and aircraft rates in the fourth quarter of an international bankruptcy period."

Sabena's business volume, he notes, is half exchange-traded within the Belgian market and accounts a majority. The other half is international and heavily competitive. Last year's volume went down this way the largest share, 35%, was in service between Brussels and the Congo, 28% was North Atlantic, 21% Europe/Middle East and 12% service within the Congo itself.

An unusual feature of Sabena among the major carriers is that only 39% of the airline's business was passenger, 35% freight and only involved 45% dry cargo.

But Sabena's U.S. manager F. J. Martens notes that "Introduction of tourist traffic in Europe has apparently since doubled the number of trans-Atlantic or foreign" Sabena trans-Atlantic passenger volume this May may soon double that of a year ago. Of Sabena's May total, 85% went tourist and only 15% chose standard class accommodations.

## BEA Profit Trend

### To Start Next Year

British European Airways Corp officials think that beginning next year the airline will be writing its accounts in black ink. The airline's deficit should be eliminated in the 1983/1984 financial year when the subsidies Victoria Vassour and new Aeroplane Ambassador go into their stade.

BEA chief executive Peter Mansfield believes that the firm's short-term, which can be within a year or two, of technological obsolescence. These characteristics contribute to the lower debt/equity ratio of reliance on debt as compared with common stock financing, for both fixed capital and working capital requirements."

## Taxiway Radii Under Study

An active study to determine proper radii of curvature of airport runways for use by aircraft at speeds in the neighborhood of 50 mph is underway at San Francisco Airport.

The Institute of Transportation and Traffic Engineering, University of California, a working unit the data is in cooperation with United Air Lines. The study uses photogrammetry, the aircraft being fitted with a motion picture camera to record side movement of the plane in relation to a grid pattern painted on the test area. Tests thus far have involved DC-9 and DC-6 types, next phase will utilize a Convair 580.

The studies were suggested by CAA.

## Airlines Set New Space Regulations

Scheduled airlines with passenger flights have the month for the first time started officially circulating instructions of all passengers who must leave a plane within two hours if they exceed their space by six hours before plane departure time.

This is the airlines' first all-out try to ease losses from "no-show" passengers. "No-shows" are those who fail to show up at the gate but fail to show up at plane time.

According to Air Transport News the new rules will not only protect the passenger when he has a reservation, but at some other time when he has no reservation, it may enable him to obtain space on short notice."

Here are the rules passengers cannot know to be sure of keeping their reservations:

• In making a reservation, leave a phone number the airline usually asks for a name. This confirms your reservation automatically, even if you don't reach the number. But if you don't have a number, you must call and confirm your reservation six hours before plane time.

• On roundtrips and stopovers where you lay over more than 12 hr you must reconfirm your reservation six hours before plane time to be positive of keeping a reservation. If the plane is sold out, others are trying to get reservations and you haven't reconfirmed your space, the airline will sell your reservation to a new applicant.

## Big Airlines Bid For Capital Merger

The big airlines have started exploring merger chances with Capital Airlines in earnest since the Northwest-Central bidding bid through.

The report it is reliably reported that the bids with which the big airlines have been put out as a chance for airline improving the financial base and future growth potential of their interests.

United talk had gone furthest as of last week. But American, Eastern and National were not far behind. None had got beyond first base, up to speak, but all are in the running.

So far, Civil Aeronautics Board has not been sold why it stands as the master. Talks haven't gone that far. But the Board will have to hear them as soon as there is any substance to a merger proposal, a Capital executive says.

► Capital's Value—Only last month CAAs Chairman Donald Nyberg finally cleared Colonial Airlines by putting

price above all other things on the merger posture. But an airline financial expert notes that an airline need not worry much over the problem of Board approval of merger plans when the trans action is a short exchange at about market price. Then, he notes, the price is set by the general public.

► The Marsh Bid—As to the question of whether the Board would approve Capital merger with one of the guests, a Wisconsin carrier says, "I don't think the Board is opposed to going into it in a few years ago, there's no sense to do it now." The carrier does not have the transpact and doesn't know.

► Capital's Angle—Despite Capital claims that these big airlines have no problem with Capital, after five years, observers believe a Capital bid brought them in.

And Capital is well aware that Northwest Airlines, second choice in some combination of Capital with Delta and/or National, either one of which would cause a sort of second United Airlines.

## Avinetea to Serve Salvador Republic

(McGraw-Hill World News)

San Salvador—The El Salvador government has taken steps to build up its communications network by granting Avinetea, Guatemala's airfield-owned airline, permission to begin passenger and cargo services between San Salvador and Puerto Barrios, which would be a port for the landlocked Republic.

Avinetea reportedly is scheduled to start immediately using C-46 and C-47 transports. San Salvador may be its second to serve San Salvador and Guatemala City.

Much of San Salvador's imports come through Puerto Barrios and up to now have been handled on a single narrow gauge railroad.

At the present time there is no other competing link to the portage town which handles hundreds of millions of dollars in imports and exports annually.

## Expand Filippino Fields

(McGraw-Hill World News)

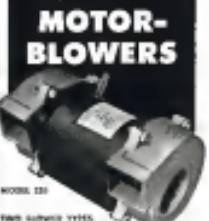
Manila—A new airport is being built at Capas, Ilocos, capable of taking C-47 type aircraft. One of its runways will be over 1,000 ft. It is being built also underway on the island of Jolo, Tuguegarao, Cagayan de Oro and Tagbilaran. The runway and airport at Manila International Airport are being improved to take heavier aircraft. Survey parties are looking over suitable sites in Mindanao and Visayas.

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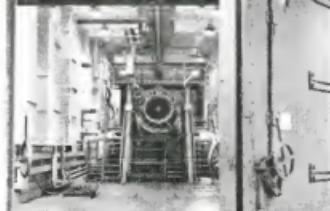








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building, both recently completed, and a new Components Development Center now under construction. One large building, previously used for assembly of production engines, is now devoted to development work to bridge the difficult gap between experiment and production. Two huge new test cells, with a common control room, have been built especially large to accommodate engines of extremely high thrust ratings.

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